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ABSTRACT

Hypothesizing that students who were given the opportunity to choose their learning activities in a residential outdoor education school (Stone Valley, Pennsylvania) would more readily attain the behavioral objectives of those activities, 68 fifth grade students participating in a four-day residential outdoor education program were divided into a control (N=32) and an experimental (N=36) group. Planned by classroom teachers, the Outdoor School Director, and the investigator, the same objectives and learning activities (water ecology, forest plants, a graveyard trip, and survival simulation) were scheduled in such a way that the control group had only one choice of activity, while the experimental group was offered four different activity choices during each of the two, two-hour daily activity periods. A written, objective test consisting of 10 questions based upon the activity objectives was administered to the subjects in their classrooms during the week before and after the outdoor school experience. Comparisons were made between: the entire control group and the entire experimental group; the entire control group and members of the experimental group participating in the activity for which objectives were tested; and pre- and post test scores within each group. Results indicated no significant differences between the control and experimental groups, although both groups demonstrated significant learning. (JC)

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The Pennsylvania State University

The Graduate School

College of Health, Physical Education, and Recreation

A Comparison of Children's Learning Under Different Program Structures in a Resident Outdoor School

A Thesis in

Recreation and Parks

by

Michelle Conrad

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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CHAPTER I

INTRODUCTION AND STATEMENT OF PROBLEM

A child's learning in school is influenced by many factors. Among these factors are the personality of the teacher, the physical environment, the social environment, the organization and approach of the instruction, and other factors relating to the content of the learning activities and to conditions within the learner. Although the influence of these factors has been recognized since the middle of this century, it has only been since the late 1960's that attempts have been made to control these factors to create optimum learning situations. Prominent among these attempts are many new and innovative approaches to the organization of schools and structure of curricula. (1,4, 28,30)

One feature of the new designs found rather consistently is the emphasis placed on the learner as an individual with interests and abilities different from his peers. This emphasis is reflected in a new structuring of learning situations which allows students to have freedom in choosing subjects they wish to study and in pursuing activities at a rate of learning appropriate for their abilities. (1,4,27,28)

Another feature of many of the new programs is a written statement of objectives for learning activities. These

objectives are, for the most part, expressed in behavioral terms which describe how the student is expected to perform when he has completed an activity. The significance of these behavioral objectives is that they not only clarify just what a particular lesson is intended to communicate, but also provide criteria for evaluating whether or not this communication has been accomplished successfully. (12,24,31)

Although behavioral objectives are gaining widespread use at all levels of education, they have not yet been used to any great extent in outdoor education programs. This should not mean, however, that outdoor education programs cannot be planned using behavioral objectives. It should be possible not only to plan with them, but also to evaluate a program by measuring the students' attainment of the objectives.

In addition to planning and evaluating outdoor education programs with behavioral objectives, it should also be possible to try to implement some of the new alternatives in education for structuring learning situations. One of the alternatives of particular relevance to this study is that of allowing students to choose learning activities in which they will participate. Implementing this alternative of choice in a resident outdoor education program and then determining its effectiveness in terms of students' learning are major considerations of the problem of this study.

Statement of the Problem

The purpose of this study was to determine what effect choice of participation in learning activities has upon the attainment of the behavioral objectives specified for the activities.

Hypothesis

It was hypothesized that the attainment of objectives is greater for students who are allowed to choose activities in which they participate than for students who are not given a choice of activities.

Delimitations

The setting for the study was delimited to the Stone Valley Outdoor School operated by The Pennsylvania State University. Subjects were delimited to 68 fifth grade students from the State College Area School District in Pennsylvania. The duration of the resident outdoor school program was delimited to four days. Measurement of the attainment of objectives was delimited to those objectives which could be measured through a written test.

Definitions

The following terms are defined as they apply to this study:

A behavioral objective is

> An intent communicated by a statement describing what the learner is to be like when he has successfully completed a learning experience. It is

> a description of a pattern of behavior (performance) we want the learner to be able to demonstrate. (24:3)

A counselor-teacher is an individual who volunteers to take a leadership position at the Stone Valley Outdoor School for one week and assumes the responsibilities for guiding and teaching a small group of children in various social and educational activities.

A learning activity is a scheduled program event, usually lasting for about two hours, in which the student participates to attain specific educational outcomes.

The Stone Valley Outdoor School is a resident camp to which classes of elementary students and their teachers come for a week to participate in a program of educational, recreational, and social activities that are an integral part of their school curriculum.

Basic Assumption

It was assumed that the choices of activities made by a child in the experimental group were based upon the child's interest in the activities.

Limitation

A major limitation of this study was the influence that the attitudes, behavior, experience, and personalities of the counselor-teachers may have had upon the students' learning.

CHAPTER II

REVIEW OF LITERATURE

The problem of this study was an investigation of the effect of choice of participation in learning activities upon the attainment of the objectives for the activities. Student involvement in choosing and directing learning activities is a major emphasis of the new educational alternatives implemented in many public and private schools since the late 1960's. Because interest in such alternatives is so new, however, little research has been conducted to substantiate claims that students participating in the new programs perform better than students participating in traditional programs. For this reason, the following review of literature presents studies and findings which are related to educational alternatives and student interests, as well as studies concerned with measured outcomes of outdoor education experiences.

Research on the following specific topics is presented in this chapter: student interests and achievement, student interests and educational alternatives, educational alternatives and outdoor education, and evaluation of resident outdoor education programs.

Student Interests and Achievement

It is a common assumption among many educators that achievement is positively related to student interests and

that providing a student opportunities to engage in learning activities in which he is interested will help him to realize greater learning outcomes from his experience. If this is true, one would then expect that a child "can get the most out of school instruction if it is related to the things he knows, the things he does, and the things he is interested in." (25:107) In addition, it might be expected that when a person is interested he will invest more time in the learning experience and that this will be reflected in higher grades and, therefore, greater acheivement. (32:199)

With such a widespread belief in these assumptions, as is reflected in educational psychology textbooks and in the new approaches to education such as open schools, it is striking to find so little research directly related to the topic. As Thomas et al. (32:199) pointed out, however, the assumptions are accepted readily and their validity is seldom tested.

In one of the earliest attempts to determine whether a relationship exists between interests and educational development, Frandsen (14) administered the Kuder Preference Record and the USAF Test of General Development to college sophomores. Results offered substantial support to the hypothesis that interests are related to achievement when achievement involves performance over a long period of time.

Also using college students as subjects, Thomas et al. (32) compared responses on interest questionnaires with grade point averages. Their findings gave only partial support to the hypothesis that interest would be related to higher grades.

To investigate the relationship of interests to school achievement for high school students, Frandsen and Sessions (15) compared grade point averages with two different measures of interest. The results provided evidence that some students have congruent interest and achievement patterns, while others are more highly motivated to achieve by extrinsic factors.

The fact that external motives can obscure the effects of interest was recognized by Edwards and Wilson (13) in their study of interest and achievement in high school chemistry. Their findings showed that when other variables related to achievement are held constant, intrinsic interest in science and achievement in chemistry are related.

Barrilleaux (3) also attempted to relate high school science achievement to interest and IQ. Over a period of ten years he collected overall grade point averages, high school science grade point averages, IQ scores, and measures of interest from high school students. The results of his investigation revealed that within an IQ range of 86 to 139 there is a high, significant, positive correlation between relative intensity of science interest and probability of success in high school science.

A relationship between science interest and achievement was also supported by the findings of Frandsen and Sorenson (16). Using high school students in the tenth grade as subjects, they compared interest and knowledge in the areas of science and literature. It was reported that students who ranked science high among their interests tended to learn more than equally intelligent students who ranked it as medium or low in interest.

Because it is closely associated with interests, the topic of attitudes and their relationship to achievement is also of relevance herein. Ohles (27) considered attitudes to be internal conditions from which motivation evolves as a force that results in action. From this viewpoint it might be expected that positive attitudes would be related to greater achievement. Research offers variable findings on the topic.

Neale, Gill, and Tismer (26) undertook a study of 215 sixth graders to investigate relationships between attitudes toward school subjects and measures of school achievement. Attitude, achievement, and intelligence measures were taken at the beginning and end of the school year using a semantic differential scale. Findings showed that for boys, attitude and achievement were correlated for social studies, arithmetic, and reading; for girls, a significant correlation was obtained only for reading.

Jackson and Lahaderne (21), also studying sixth graders, compared measures of scholastic success and general attitudes toward school. The results did not provide any significant correlations between the two.

Student Interests and Educational Alternatives

Since the beginning of the 1970's there has been a greatly increasing number of alternative approaches to education initiated in both public and private schools. The main thrust of these alternatives is an attempt to make education and schooling more student-centered and to involve the learner as an active participant in making decisions about his own education. Content is viewed more as a vehicle to the purposes of achieving the desired goals of schooling: "independence, critical awareness, responsibility to self and society, intelligent decision making, and the capacity for self-fulfillment." (4:107)

In some instances the alternatives offered are in terms of the total content and structure of the curriculum; in others only the approaches to specific subjects have been altered. Because the nature of the content and/or the structure involved in these alternatives is so variable, the task of comparative research is rather difficult.

In a review of research on nongraded elementary schools, Pavan (28) offered the following findings: a) comparisons of graded and nongraded school students using standardized achievement tests favor the nongraded

groups; b) many recent studies include a mental health component, results of which favor nongraded students; c) fewer children are retained under nongrading; d) nongrading is beneficial for blacks, boys, and underachievers; and e) in open-space schools instruction is more individualized.

Campbell and Chapman (7) investigated differences in conceptual learning of subject matter, changes in interest in subject matter, and attitudes toward self-directed learning to make a comparison of learner controlled and teacher controlled learning conditions. Findings showed no significant differences between the groups in terms of achievement, but the learner controlled group did show a significant increase in interest in the subject matter by the end of the course.

Outdoor Education and Educational Alternatives

From the point of view which considers outdoor education to be a method or a particular kind of approach to learning, it may be argued that it is somewhat comparable to some of the alternative approaches to education which now emphasize self-discovery and direct experiences. These aspects of outdoor education are seen by several of the more prominent leaders in the field as a means of curriculum enrichment. (19,20,29) Smith et al. (29:43) cited several contributions of outdoor education that are claimed to be offered by many of the newer approaches to

learning: stimulation of interest, abundance of materials, and opportunities for exploration and research.

Similarities also exist between outdoor education and educational alternatives in terms of the role of the teacher. As Gross and Railton pointed out, "the role of the teacher changes from a dispenser of facts to that of provider of opportunity for learning." (18:9)

From another point of view, outdoor education might be considered as a content area. If one agrees with this viewpoint, then it becomes plausible to consider the benefits that some of the new learning approaches might have related to resident outdoor education programs. Davidson (11) investigated such a possibility with fifth and sixth graders in a resident outdoor program. For the study he divided the students into two camps: one camp was adult-centered and operated according to a fixed schedule of activities; the other was child-centered and operated with a flexible schedule. In measuring self-concepts it was found that there was no significant difference in growth between the two camps, but the items of positive change were different for the two groups.

Evaluation of Resident Outdoor Education Programs

Despite a growing number of research studies concerned with outdoor education, very few involve the evaluation of the learning outcomes of the resident experience. An overview of study topics revealed that most are concerned with

program development, administration, or evaluation of attitudes of parents, students, and teachers. Of those which have investigated cognitive outcomes, findings generally indicate that students make consistent, though not strong, gains in knowledge, but these gains are not always significantly greater than those of students who do not participate in the outdoor experiences.

Ball (2) used a test on a forestry unit to measure retention of information one year following a resident experience. The test was administered to fifth graders who participated in a three day resident program. Results showed that students who participated in the program received higher scores than those who did not.

Cragg (9) administered a test to measure knowledge of nature study and vocabulary. The test was taken by students before and after a one week resident program. Her findings showed that children attending the program made definite advancements over those who did not.

Daniels (10), as part of a broad evaluation of a resident program, measured specific knowledge, awareness, appreciation, and understanding of national ecological problems. A general gain in specific knowledge was indicated by the findings.

Kaplan (22) investigated the effectiveness of a resident outdoor education experience on the development of learning processes, including the ability to recognize and identify living organisms and relationships between them.

Following a one week experience, fifth and sixth grade students made significant gains in identification of objects and relationships; however, the gains were not significantly greater than those of a control group which remained at school.

Also using fifth and sixth grade subjects, Kaspar (23) investigated the effect of indoor and outdoor settings for teaching a five week non-resident environmental education program. From pre- to post-test, the mean total scores were significantly higher for the group taught outdoors.

CHAPTER III

PROCEDURES

The purpose of this study was to determine what effect choice of participation in learning activities has upon the attainment of the behavioral objectives specified for the activities. To investigate this problem it was necessary to develop and implement in a resident outdoor school a program of learning activities for which behavioral objectives were specified. It was also necessary to develop a test to measure attainment of the objectives of the activities.

Development and Implementation of the Program

Selection of subjects. During the four day period that the program for this study was implemented, a total of 74 fifth grade students attended the Outdoor School at Stone Valley. This total represented the membership of three classes from the same school in State College, Pennsylvania. Each of the classes was heterogeneous in terms of the sex and academic ability of the students and all of the students were considered by the teachers to be average or above average academically. No students of low ability were included because they were assigned to a different cluster in school than were the participants in the study.

Of the 74 students who participated in the activities at the Outdoor School, only 68 were used as subjects since six were absent during one or both administrations of the test instrument. This total represented 36 students who participated under an experimental program structure and 32 students who participated under a control structure. Of the 36 experimental subjects, 15 were from Class A, 12 were from Class B, and 9 were from Class C. Of the 32 control subjects, 10 were members of Class A, 9 were from Class B, and 13 were members of Class C.

Prior to their arrival at the Outdoor School, students were assigned by their teachers to one of eight small learning groups. Each group consisted of eight or nine members and was heterogeneous in terms of sex, academic ability, and class membership. Of the eight groups, four were randomly chosen to participate in the program under an experimental structure while the remaining four participated in the program under a control structure.

Students under the control program structure remained in their small groups while participating in morning and afternoon learning activities, in evening program activities, and while doing capers (cleaning the lodge, raising the flag, setting tables, etc.). Students under the experimental structure remained in their small groups only while participating in evening activities and while doing capers; during morning and afternoon learning activity periods these students individually chose the activities

they wanted to do and, thus, did not remain in their small groups. During free time, both control and experimental subjects chose the recreational activities in which they wanted to participate.

Because students under the control structure were not given a choice of activities, all 32 of them participated in all of the learning activities of the program. Since students under the experimental structure were allowed to individually choose their activities, the number participating in each activity varied. The numbers of those who actually participated in each activity were as follows: 22 in water ecology, 12 in forest plants, 36 in the trip to the graveyard (which included map and compass activities), and 25 in the survival simulation. Those actually participating in the activity are referred to in the text which follows as "experimental participants" in contrast to the experimental group which included everyone in the four small learning groups assigned to the experimental program structure.

Planning the program. Approximately one month prior to the students' attendance at Stone Valley, the investigator and one of the associate directors of the Outdoor School met with the classroom teachers to discuss the operation of the resident program. After they were given basic information regarding the daily schedule of activities, the reponsibilities of the staff, and their role while at the

Outdoor School, the teachers were asked to outline the subject content that the students had been studying in their classrooms over the year, particularly during the spring, and to indicate the content areas and activities they wanted to have included in the Outdoor School program. The information given by the teachers showed that all three classes had been studying the same subject content during the year.

During the week following the initial meeting, the learning activities for the program were planned. For each content area or general type of activity that was to be included, a set of behavioral objectives was developed and specific activities were planned through which these objectives could be attained. These activities were then incorporated into two program schedules, one for the control group and one for the experimental group. For the control group, only one activity, in which all students would participate, was scheduled for each activity period. For the experimental group, four different activities were scheduled for each period and students were able to choose the one in which they would participate.

In a second meeting with the teachers, plans for this study were discussed and copies of the experimental and control program schedules and activities were given to the teachers for their suggestions and approval. Copies of the schedules may be found in Appendix A.

The learning activities. Although the two program schedules were different, the activities and their content were the same. The activities for which attainment of behavioral objectives was measured included water ecology, forest plants, a trip to the graveyard (including map and compass work), and a survival simulation. A brief summary of each of these activities follows:

I. Water Ecology

The activity began with a brief discussion of habitats, horizontal strata, and classification of aquatic plants. At the water students observed plants from each strata and compared stems, roots, and leaves to determine similarities and differences among plants in the same class. Students also examined the plants and the areas from which they came to find animal life or evidence of it. Based on their observations and previous knowledge, they discussed interaction of plants and animals, emphasizing how each might benefit from the other.

II. Forest Plants

The introductory presentation for the activity was a lecture and discussion on plant characteristics and identification. The discussion was followed by a hike on which students identified common plants of the area using notes and drawings provided as field guides. Several kinds of edible wild plants were collected, prepared, and tasted, and other plants that had been identified were discussed in terms of their usefulness to man and animals.

III. A Trip to the Graveyard

A demonstration of how to diagram a family tree and a discussion of procedures to follow while in the graveyard and returning from it served as an introduction to this activity. Following this the students hiked to the graveyard site, about one mile away. At the graveyard, students completed data charts and diagrammed family trees for the people buried there.

On the return hike, students received instruction in the use of map and compass to find one's location and direction of travel to his destination. The hikers then used the information to find their way back to camp by traveling cross-country in a single direction.

IV. Survival Simulation

The introduction for this activity was a discussion of what a person must have in order to survive and how these essential needs could be satisfied in a natural environment. Taking with them only a minimum of survival items, small groups of students were led into an area of the woods with which they were not familiar and told that they were lost. Without the help of the counselor-teacher, each group worked out a plan for survival according to an instruction sheet given to the group's chosen leader.

In addition to the preceding activities, a number of other activities, for which attainment of objectives was not tested, were included in the program. Of these others, both the control and experimental groups had opportunity to participate in Apartment Hunting (Acclimatization), Action Socialization Experience (ASE), and an Orienteering Race. Only the experimental group had opportunities to participate in Perception Points, Block of Soil, Toothpick Hunt and 100" Hike, Fossil Hunt, and Homestead Expedition. Details of the activities and the behavioral objectives for each are found in Appendix B.

Selection and training of staff. The permanent staff at the Outdoor School consisted of a director, two associate directors, and two half-time resource assistants. In addition to the permanent staff there were 13 people serving as counselor-teachers for the week. These persons were all volunteers who were recruited from Education and Recreation courses at The Pennsylvania State University.

Because many of the volunteers had not had previous experience in resident outdoor education, it was necessary

to have them participate in a one day training program prior to the week of the resident experience. This training program was conducted by the investigator and other members of the permanent staff at the Outdoor School. The purpose of the training was to provide an orientation to the facilities and the operation of the program and to provide an opportunity to familiarize the counselors with the content of the program through participation in the learning activities which had been planned for the week.

At the beginning of the training session, all of the counselor-teachers were given copies of the written materials listing the behavioral objectives and describing the activities in which all of the students would have an opportunity to participate. Then, following a brief introduction to the Outdoor School, all were taken outside to participate in the activities under the leadership of permanent staff members who exemplified how the activities might be conducted by the counselor-teacher when he or she assumed the leadership role with the children. In addition to participating in the exemplary versions of activities that would be offered to all students, counselor-teachers who worked with the experimental group participated in training for leadership of other activities that would be offered only to the experimental program subjects.

During the training the counselors were told that the students would be divided into two groups and that each group would follow a different program structure but the

content of the activities would be the same. They were not told directly of the nature of this study, but were informed that an investigation was being conducted to determine the effectiveness of the program structures.

Implementation of the program. While at the Outdoor School, all of the students followed the same daily schedule of events. This schedule allotted time for meals, capers, learning activities, recreational activities (free time), quiet time after lunch, large group activities in the evening, a campfire program, and sleep. The time for learning activities was provided in two-hour blocks, one each morning and one each afternoon, and it was for these periods that the planned activities were conducted according to the different schedules of the control and experimental groups. During all other times, the students shared in the same experiences and had opportunities to associate with students in other learning groups.

The learning activity sessions for the control group were conducted in the following manner: all of the students were brought together and given a brief introduction to the activity by a member of the permanent staff; the students then separated into their small learning groups and proceeded to carry out the activities for the session.

Like the control group, the members of the experimental group were brought together at the beginning of each activity session. Once everyone was present, the students

separated into groups according to the choice of activity in which they wanted to participate. In each of the various activity groups thus formed, a brief introduction to the activity was given by either a member of the permanent staff or a counselor-teacher, depending on the activity, and then the group proceeded as directed. Whenever the number of students participating in an activity was large, the students were separated into small groups of no more than eight or nine and one or two counselor-teachers were assigned to work with each group.

With the exception of the afternoon of the first day, choices for activities were made the day before they were to occur. The only condition made upon choices was that no activity could be chosen more than once. Students were made aware on the first day that almost all of the activities were offered two or three times so that they would have a chance to participate in all of those that they might want. Records were kept of the activity choices made by each student throughout the week.

To maintain some control over the instruction given to both groups, each permanent staff member was responsible for one type of activity, such as water ecology, survival simulation, etc., and was present to give the introduction and explanation of the activity each time it was offered to either of the groups. This helped to some degree to insure that for each of the content areas tested on the study

instrument, both control and experimental students received the same information and directions for activities.

The leadership for the participation of the children in the learning activities was the responsibility of the counselor-teacher(s) assigned to work with the students. In the control group, each counselor-teacher worked with the same small learning group for the entire week. In the experimental group, each counselor-teacher was assigned to work with one activity rather than a particular group during each activity period. Since the choices during each activity period differed, the counselor-teachers did get to lead different activities throughout the week, but did not work consistently with the same group of students.

To eliminate the possibility that students in the experimental program would base their activity choices on a desire to be with a particular counselor, the assignments of counselor-teachers to activities were not made known to the students before the activities were conducted.

Development of the Test Instrument

The instrument used in this study was a written, objective test developed by the investigator. The purpose of the test was to measure the students' attainment of the behavioral objectives specified for four learning activities in which both the control and experimental groups participated.

Basis for development. The development of the test was necessary because no instruments previously used for evaluating cognitive outcomes of environmental education programs were suitable for the purposes of this study. The reason for this was that the objectives of the resident outdoor school activities were very specific and, therefore, measurement of the attainment of the objectives required an instrument that would specifically test for each objective.

The completed instrument consisted of a total of ten questions, each of which measured the attainment of one behavioral objective. This total included questions for all but one of the objectives for the four activities (which included five content areas) and, thus, covered almost the entire scope of content that the activities were intended to communicate. The one objective for which no question was developed involved the performance of a perceptual-motor skill (estimating a distance by pacing) which could not be practically included in the test.

Each question was presented differently on the test in order to obtain responses that would be the most appropriate measure of the attainment of the objectives. By thus using the format that was most applicable in each situation and basing questions directly on the behavioral objectives, face validity for the instrument was established.

The test questions. The ten questions on the test can be grouped into five sections, each section consisting of questions covering the objectives of one content area. Each question tested for the attainment of only one behavioral objective. Listed below are the objectives and test questions; see Appendix C for a copy of the complete test.

Section I: Water Ecology

Three objectives were specified for the water ecology activity; they were tested by questions 1, 2, and 3 on the test.

Objective: To classify macroscopic water plants as being floaters, emergents, or submergents.

Question 1: A cross-sectional diagram of a lake and eight various kinds of plants within it is shown. Students are asked to list in groups the plants which go together. Three groups are to be formed using each plant in only one group.

Objective: To describe one structure characteristic of the plants in each class of aquatic plants (emergents, submergents, floaters) that determines why the plants are grouped together in their class.

Question 2: Students are asked to refer to the groups created in the first question and to tell one or two ways in which all of the plants in the same group are alike.

Objective: To list three ways in which plants may be used by animals in a water environment.

Question 3: Students are directed to list three different things which plants can provide for animals in an aquatic environment.

Section II: Forest Plants

Questions 4 and 5 tested for the attainment of the two objectives for the forest plants activity.

Objective: To identify three edible wild plants and state which part(s) of those plants can be eaten.

Question 4: Pictures of six wild plants and their common names are shown on the test page. Subjects are directed to circle three plants that are edible and under each tell which part(s) can be eaten.

Objective: To identify two plants that may be used by man or animals for something other than food and to state the specific uses of each.

Question 5: Pictures of six wild plants and their common names are given. Directions are to circle two plants that are useful to man and/or animals for something other than food and to state the way(s) in which each is useful.

Section III: Graveyard

One objective for the trip to the graveyard activity was tested in question 6.

Objective: To construct a family tree based on inferences from data collected from tombstones in a graveyard.

Question 6: A list of names, with dates of birth and death for each, is presented as hypothetical data which might be collected from tombstones in a graveyard. Below this list is a skeleton of a diagram of a family tree for three generations. Students are asked to complete the tree by putting names from the list where they would appropriately belong.

Section IV: Map and Compass

Questions 7 and 8 tested for the attainment of the two map and compass objectives.

Objective: To calculate the distance from one point to another on a map by using the scale.

Question 7: A map drawn to a scale of two inches for each mile is presented. Subjects are given rulers and asked to figure the actual distance between two points named on the map.

Objective: To list in order the procedures one would follow in using a map and compass to determine the direction from one place to another.

Question 8: Explanations are given of the first two steps one must take when using a map and compass to determine the direction from one place to another. Students must give the remaining step.

Section V: Survival Simulation

The two objectives specified for the survival simulation were tested in questions 9 and 10.

Objective: To list the three essential needs a person must satisfy in order to survive.

Question 9: From a list of seven items students must circle the three which are essential to human survival.

Objective: To name or describe at least two sources or means of obtaining water, food, and warmth in the wilderness.

Question 10: A list of five methods of obtaining water in outdoor areas where no pumps, wells, or faucets are available is presented. Students are asked to indicate which two of the five are methods of obtaining water that would be safe for drinking.

Scoring the test. To facilitate comparisons of the results, the test sections were equally worth 15 points each, making the total possible on the test 75 points. The actual point values awarded for responses varied with the questions, but, overall, were assigned so that they were spread as evenly and fairly as possible over the questions in each section.

A scoring key which included correct answers and point values was used by the investigator and an assistant to score all of the tests. (See Appendix C.) The values possible for responses were as follows:

Question 1. Each correct grouping was awarded two points.

Question 2. For each group for which at least one common characteristic was identified, two points were awarded.

Question 3. Each correct response received one point.

Question 4. Each correct name circled received one point; each correct listing of edible parts received two points.

Question 5. Each correct name circled received one point; each correct description of use(s) was awarded two points.

Question 6. Correct completion of the family tree was awarded 15 points; if incomplete, one point was awarded for each name correctly placed and two points were given for each completed generation.

Question 7. Six points were awarded for the correct answer.

Question 8. Nine points were awarded for a complete, correct response; if incomplete, six points were given for telling how to manipulate the compass and three points were given for telling how to read the direction.

Question 9. Each correct response was awarded three points.

Question 10. Each correct response was awarded three points.

Measurement of the Attainment of Objectives

Administration of the test. The test was administered to all of the subjects in their classrooms once during the week immediately preceding and once during the week immediately following their experience at the Outdoor School. On both occasions the test was administered by the investigator to each class. Only one class at a time was tested and the classroom teacher did not remain in the room throughout the test period. Each class was tested in the morning and allowed 25 minutes to work on the test.

Students were allowed to ask questions of the investigator during the test and those students who had difficulty reading were given assistance.

Treatment of the data. For both the control and experimental groups, mean scores on the pretest and post-test administrations of the instrument were calculated for each section and for the total of all sections. Because many members of the experimental group did not choose to participate in all of the activities for which attainment of objectives was tested, mean scores for each section were calculated twice, once using the scores of all students in the experimental group and once using only the scores of those who participated in the activity for which the section tested. These students are referred to in the tables and text as experimental participants.

Since three different classes were represented by the study population, a one-way analysis of variance among pretest scores and among posttest scores was computed for the control group, for the experimental group, and for the experimental participants. The analyses were done by computer using the ANOVES program from the Statistical Program Package (STPAC) at the Liberal Arts Data Laboratory of The Pennsylvania State University. The significant variances found were tested with the Scheffe S test (8,9) for differences between means.

Using a t-test for correlated data (6:181), the differences between the mean scores on the pretest and the posttest administrations of the instrument for the control group were tested for significance. The same test was also made for the experimental group, once using the mean scores for the entire sample and once using only the mean scores of those who participated in the activities for which the questions tested.

To test for a significance of difference between the means of the control and experimental groups, a t-test for independent samples (6:175) was used. The test was made for mean pretest scores, mean posttest scores, and for mean change from pretest to posttest. Comparisons were made first using the entire population of each group, then again using the entire control group but only the participants from the experimental group.

A graphic presentation of the ranges of mean scores for the control group, the experimental group, and for the experimental participants was also included for purposes of comparing the pretest and posttest levels of and the amount of change in attainment of the objectives.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to determine what effect choice of participation in learning activities has upon the attainment of the objectives for the activities. The results of this investigation are presented here in the following sections: attainment of objectives prior to the outdoor school experience, attainment of objectives following the outdoor school experience, changes in attainment of objectives prior to and following the outdoor school experience, and comparisons of the ranges of mean scores prior to and following the outdoor school experience.

Attainment of Objectives Prior to the Outdoor School Experience

When attainment of objectives was measured prior to the outdoor school experience, there were no significant differences between the mean scores of the control group, who were not given a choice of activities, and mean scores of the experimental group, who were allowed to choose the activities in which they participated. Likewise, there were no significant differences found when mean scores of the control group on each section were compared with the respective mean scores of only those members of the experimental group who actually participated in the activities. See Table I.

TABLE I

VALUES OF t[a] FOR DIFFERENCES BETWEEN PRETEST MEAN SCORES[b] OF CONTROL AND EXPERIMENTAL GROUPS

Groups	Test Section[c] I	II	III	IV	V	Total
Control and Experimental	0.57	1.06	0.70	0.40	1.17	0.67
Control and Experimental Participants[d]	1.00	1.20	0.70	0.40	1.20	--

[a] A t value of 2.00 was needed for significance (df=66) on all control and experimental group comparisons and on comparisons of control group and experimental participants on Sections III and IV; for other comparisons of control group and experimental participants, a t value of 2.01 was needed on Section I (df=52), a value of 2.02 on Section II (df=42), and a value of 2.01 on Section V (df=55). All values are for significance at the .05 level.

[b] See Table III for mean scores.

[c] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[d] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

With one exception, there were also no significant differences among the mean scores of the three classes within the experimental and control groups prior to the outdoor school program. The one exception was the significant difference found among the means of the classes within the control group on the test section which measured attainment of the objectives for the graveyard activity. The difference was confirmed by the Scheffe S test. See Table II.

The measures of attainment of the behavioral objectives of the activities prior to the outdoor school program were generally low; mean scores for each section and for the test as a whole were less than one-half of the values possible. See Table III.

For the control group, the lowest mean score, 3.38, was obtained on the map and compass section of the test, while the highest score, 7.59, was obtained on the survival questions. The lowest mean for the experimental group and the experimental participants, 3.67, was also obtained on the map and compass questions. Highest means, however, were obtained on the forest plants section of the test; 7.53 for the experimental group as a whole and 7.92 for the experimental participants only.

Individual scores and the ranges of scores on each section are found in Appendix D.

TABLE II

DIFFERENCES AMONG PRETEST MEAN SCORES

OF THE THREE CLASSES[a]

Group and Test Section[b]		Among SS	Within SS	F Ratio[c]
Classes within Control Group				
Section	I	84.4	862.4	1.418
	II	59.3	347.9	2.472
	III	423.1	1088.9	5.634[d]
	IV	11.6	271.9	0.618
	V	20.9	554.8	0.546
	TOTAL	752.1	4064.8	2.683
Classes within Experimental Group				
Section	I	173.8	832.2	3.446[e]
	II	24.1	310.9	1.279
	III	111.7	1457.0	1.266
	IV	2.4	305.6	0.130
	V	37.4	480.7	1.282
	TOTAL	29.5	4377.5	0.111
Classes within groups of Experimental Participants[f]				
Section	I	70.7	440.4	1.585
	II	2.3	88.6	0.117
	III	111.7	1457.0	1.266
	IV	2.4	305.6	0.130
	V	38.0	384.7	1.086

[a] Class means are in Table XIV in Appendix D.

[b] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[c] Determined by a one-way analysis of variance.

[d] Significant at the .01 level; F=5.42, df=2,29

[e] Significant at the .05 level; F=3.29, df=2,33

[f] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

TABLE III

MEAN SCORES OF ATTAINMENT OF OBJECTIVES
PRIOR TO THE RESIDENT EXPERIENCE

Group	Test Section[a] I	II	III	IV	V	Total
Control (N=32)	6.09	6.66	5.25	3.38	7.59	28.97
Experimental (N=36)	5.33	7.53	4.08	3.67	6.42	27.03
Experimental[b] Participants	4.64 (N=22)	7.92 (N=12)	4.08 (N=36)	3.67 (N=36)	6.24 (N=25)	---

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[b] Participants are members of the experimental group who actually participated in the activities for which objectives were tested.

Attainment of Objectives Following the Outdoor School Experience

When measures of attainment of the objectives were obtained following the outdoor school program, no significant differences were found between the experimental group, who were allowed to choose their activities, and the control group, who were given no choice of activities. This was also true when the control group's mean scores on each section were compared with the respective scores of the experimental participants. See Table IV.

Among the measures of attainment of objectives of the three classes within the control and experimental groups following the outdoor school experience, only one significant difference was found. The F value of 3.89 for class means of the experimental group on the survival section of the test was significant at the .05 level of probability. However, this difference was not confirmed by the Scheffe S test. See Table V.

All of the measures obtained following the outdoor school experience were higher than the corresponding measures of attainment prior to the program. See Table VI. For the control group, the highest mean posttest score was 11.06 for the forest plants section of the test. For the experimental group and the experimental participants, the highest mean score was obtained on the survival section of the test, the means being 10.92 for the entire group and 12.00 for the participants only.

TABLE IV

VALUES OF t[a] FOR DIFFERENCES BETWEEN POSTTEST MEAN SCORES[b] OF CONTROL AND EXPERIMENTAL GROUPS

Groups	Test Section[c] I	II	III	IV	V	Total
Control and Experimental	0.72	1.65	0.43	0.94	0.69	0.30
Control and Experimental Participants[d]	0.07	0.06	0.43	0.94	1.94	--

[a] A t value of 2.00 was needed for significance (df=66) on all control and experimental group comparisons and on comparisons of control group and experimental participants on Sections III and IV; for other comparisons of control group and experimental participants, a t value of 2.01 was needed on Section I (df=52), a value of 2.02 on Section II (df=42), and a value of 2.01 on Section V (df=55). All values are for significance at the .05 level.

[b] See Table VI for mean scores.

[c] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[d] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

TABLE V

DIFFERENCES AMONG POSTTEST MEAN SCORES

OF THE THREE CLASSES[a]

Group and Test Section[b]		Among SS	Within SS	F Ratio[c]
Classes within Control Group				
Section	I	43.0	878.9	0.710
	II	10.8	223.1	0.704
	III	179.1	1524.9	1.703
	IV	10.3	542.9	0.276
	V	29.5	455.3	0.941
	TOTAL	291.0	6051.7	0.697
Classes within Experimental Group				
Section	I	6.0	1194.7	0.083
	II	6.4	266.4	0.393
	III	48.0	1854.2	0.427
	IV	21.2	471.6	0.740
	V	69.2	293.6	3.886[d]
	TOTAL	96.4	6355.5	0.250
Classes within groups of Experimental Participants[e]				
Section	I	36.2	594.8	0.577
	II	9.8	78.2	0.563
	III	48.0	1854.2	0.427
	IV	21.2	471.6	0.740
	V	21.5	140.6	1.679

[a] Class means are in Table XV in Appendix D.

[b] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[c] Determined by a one-way analysis of variance.

[d] Significant at the .05 level; F=3.29, df=2,33

[e] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

TABLE VI

MEAN SCORES OF ATTAINMENT OF OBJECTIVES FOLLOWING THE RESIDENT PROGRAM

Group	Test Section[a] I	II	III	IV	V	Total
Control (N=32)	9.06	11.06	7.00	6.66	10.31	44.09
Experimental (N=36)	8.08	9.92	8.22	5.75	10.92	43.06
Experimental[b] Participants	8.95 (N=22)	11.00 (N=12)	8.22 (N=36)	5.75 (N=36)	12.00 (N=25)	---

[a] Section I is Water Ecology; II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[b] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

The lowest mean score for the control group was 6.66 and was obtained on the map and compass section of the test. This section was also the one on which the experimental group and experimental participants received their lowest mean, 5.57.

Individual scores and ranges of scores on the posttest are found in Appendix D.

Changes in Attainment of Objectives Prior to and Following the Outdoor School Experience

In general, almost all of the gains in measures of attainment of objectives prior to and following the outdoor school program were significant for the control group, for the experimental group, and for the experimental participants. However, differences between the control and experimental groups in the amounts of gain were not significant.

For the control group and the experimental participants, the mean values of change were significantly different on one section of the test. A t value of 2.36 on the survival section was significant at the .05 level of probability. See Table VII.

On all but one section, t values for the differences between scores of the control group prior to and following the outdoor school experience exceeded the 2.75 value needed for significance at the .01 level. The one exception was the value for the graveyard section which did not reach significance at all. See Table VIII.

TABLE VII

VALUES OF t[a] FOR DIFFERENCES BETWEEN MEAN CHANGE[b] FROM PRETEST TO POSTTEST

Groups	Test Section[c] I	II	III	IV	V	Total
Control and Experimental	0.04	1.96	1.18	1.24	1.45	0.34
Control and Experimental Participants[d]	1.00	0.87	1.18	1.24	2.36[e]	--

[a] A t value of 2.00 was needed for significance (df=66) on all comparisons of control and experimental groups and on comparisons of control group and experimental participants on Sections III and IV; for other comparisons of control group and experimental participants, a value of 2.01 was needed on Section I (df=52), a value of 2.02 on Section II (df=42), and a value of 2.01 on Section V (df=55). All values are for significance at the .05 level.

[b] See Table IX for mean change.

[c] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[d] Participants are members of experimental group who actually participated in the activities for which objectives were tested in each section.

[e] Significant at the .05 level; t=2.01, df=55.

TABLE VIII

VALUES OF t FOR DIFFERENCES BETWEEN PRETEST AND POSTTEST MEAN SCORES

Group	Test Section[a] I	II	III	IV	V	Total
Control (N=32)	3.51[b]	5.19[b]	1.95	4.22[b]	2.76[b]	7.50[b]
Experimental (N=36)	3.63[c]	2.16[d]	3.75[c]	3.63[c]	6.15[c]	9.32[c]
Experimental Participants[h]	4.22[e] (N=22)	2.36[f] (N=12)	3.75[c] (N=36)	3.63[c] (N=36)	6.95[g] (N=25)	--

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[b] Significant at the .01 level; t=2.75, df=31.

[c] Significant at the .01 level; t=2.73, df=35.

[d] Significant at the .05 level; t=2.03, df=35.

[e] Significant at the .01 level; t=2.83, df=21.

[f] Significant at the .05 level; t=2.20, df=11.

[g] Significant at the .01 level; t=2.80, df=24

[h] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

The values of *t* for the experimental group were significant for all sections of the test as well as the total. For the forest plants section, significance was reached at the .05 level of probability, but for all other sections the level was .01.

As was true for the entire group of experimental subjects, the groups of experimental participants for each activity exhibited significant increases in measures taken prior to and following the outdoor school program.

The mean changes in scores obtained prior to and following the outdoor school experience are reported in Table IX. For the control group, the greatest amount of change was recorded for the forest plants section for which the mean value was 4.40. The least amount of change, 1.75 points, was reported for the graveyard section of the test. For the total test, the mean value of change was 15.12.

For the scores of the experimental group, the greatest amount of change was recorded for the survival section of the test, for which the mean amount of change was 4.50. A low value of 2.08 was the reported amount of change for the map and compass section. On the test as a whole, scores increased by a mean value of 16.03.

TABLE IX

MEAN CHANGE IN ATTAINMENT OF OBJECTIVES
FROM PRETEST TO POSTTEST

Group	Test Section[a] I	II	III	IV	V	Total
Control (N=32)	2.97	4.40	1.75	3.28	2.72	15.12
Experimental (N=36)	2.92	2.39	4.14	2.08	4.50	16.03
Experimental[b] Participants	4.31 (N=22)	3.08 (N=12)	4.14 (N=36)	2.08 (N=36)	5.76 (N=25)	---

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

[b] Participants are members of the experimental group who actually participated in the activities for which objectives were tested in each section.

When the amount of change was considered only for members of the experimental group who participated in the activities, the highest value was the 5.76 point increase reported for the survival section. The lowest mean value was the 2.08 increase observed on the map and compass section.

Comparisons of the Ranges of Mean Scores Prior to and Following the Outdoor School Experience

Whereas the foregoing sections have discussed the significance of the differences between the various means, comparisons among the three groups on their performance as to location of mean scores along the continuum of possible scoring for each section of the test provides additional insights. It is recognized that differences between means of the control and experimental groups were not significant, as previously discussed; thus, most differences noted in this section are arithmetical and locational in nature. Explanatory discussion is primarily based upon program observations during the study.

On the water ecology section of the test, the greater range of the means of the experimental participants may be explained by the fact that their pretest mean score was more than a point lower than that of the control group while the difference between the posttest means of the two groups was only 0.11. See Figure 1.

For the forest plants objectives, the control group had a greater range of measures of attainment of objectives

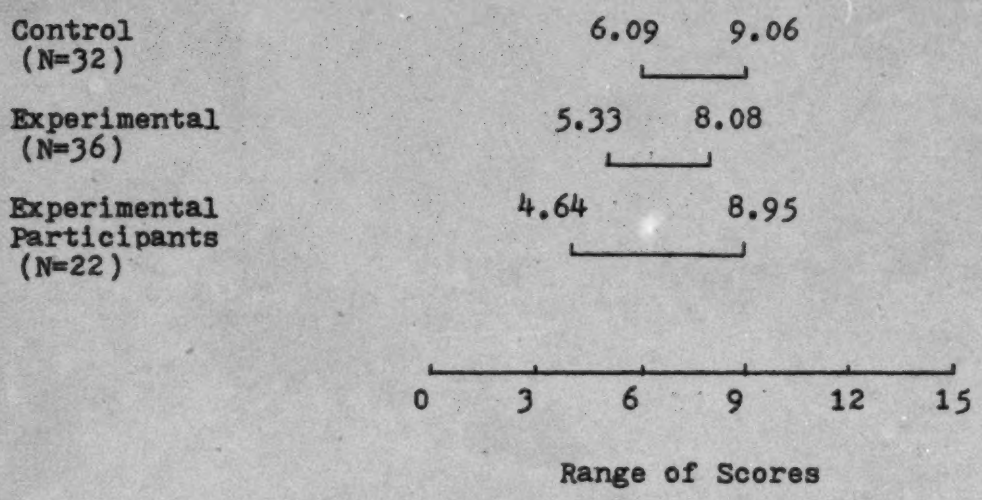

Figure 1. Range of Mean Measures of Attainment of Water Ecology Objectives

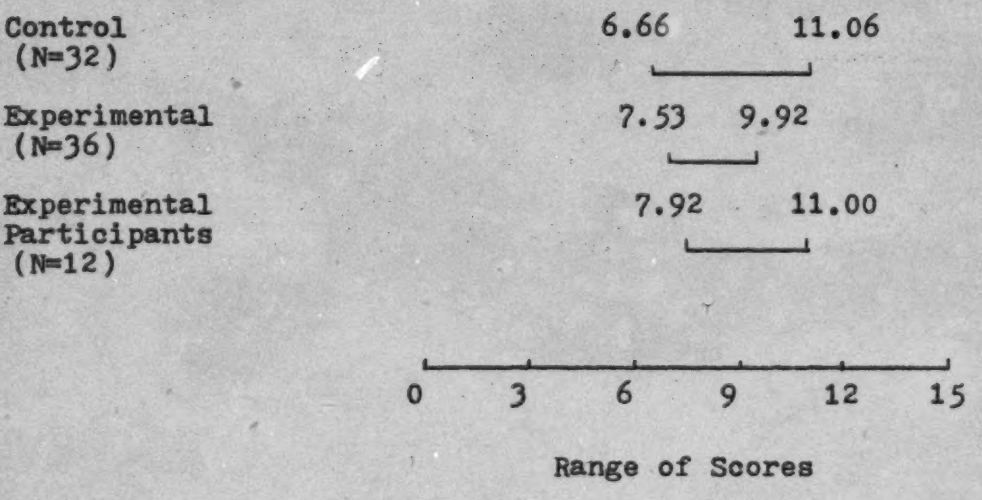

Figure 2. Range of Mean Measures of Attainment of Forest Plants Objectives

due to the fact that they had both a lower pretest mean and a higher posttest mean than the entire experimental group and the experimental participants. The differences in ranges, however, are probably explained by the small numbers of participants in the activity from the experimental group. See Figure 2.

The greater range of means shown by the experimental participants for the graveyard activity may also be attributed to a pretest mean score that was lower and a posttest mean score that was higher than the comparable scores of the control group. One possible explanation for this is that members of the experimental group went to the graveyard on different days and in smaller groups than did members of the control group who all went on the same day and thus spent less time in the graveyard doing the activity. See Figure 3.

While the range in mean scores for the map and compass objectives was arithmetically higher for the control group than for the experimental participants, which included all of the experimental group, both groups had relatively small ranges when compared with the possibilities for increases from pretest scores. Why scores on this section were so low both prior to and following the outdoor school experience may be explained by these factors: 1) most students were unfamiliar with the use of a map and compass prior to the outdoor school program, and 2) during the program, instruction in the use of a map and a compass was given

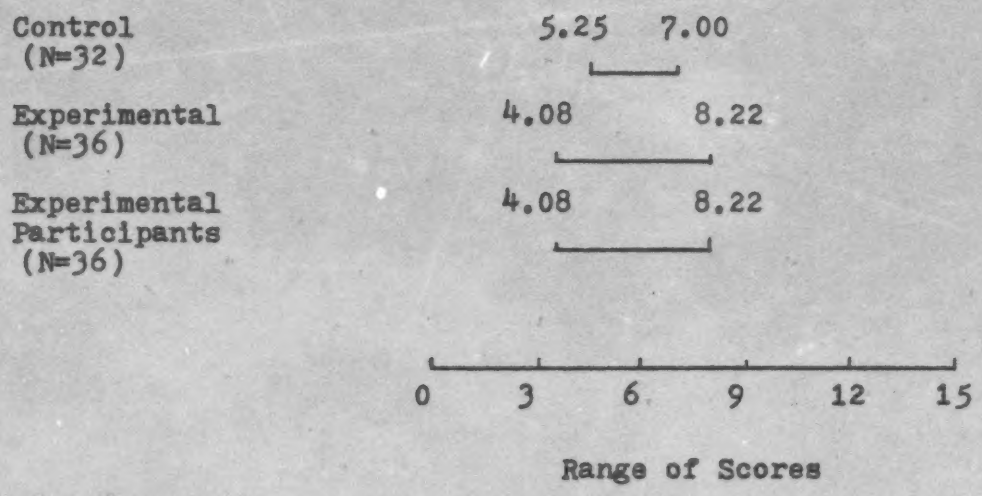

Figure 3. Range of Mean Measures of Attainment of A Trip to the Graveyard Objectives

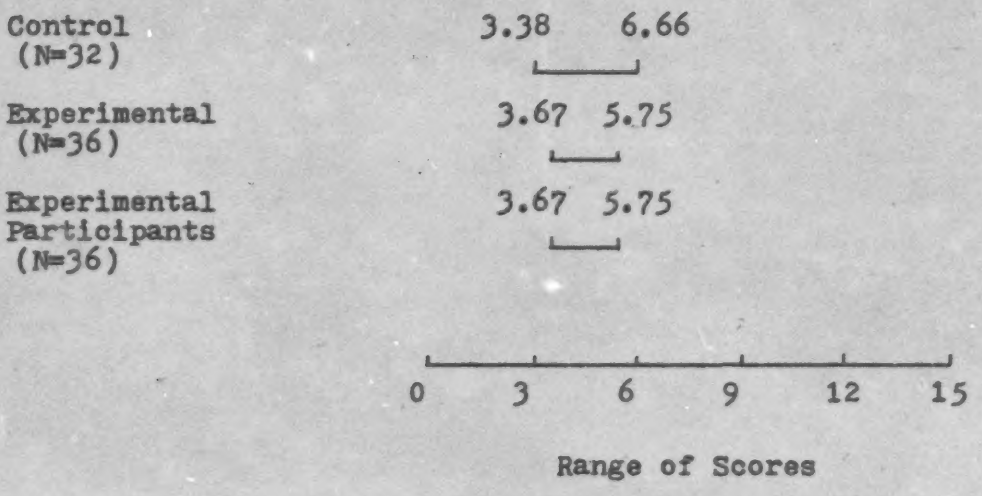

Figure 4. Range of Mean Measures of Attainment of Map and Compass Objectives

during the same activity period as the trip to the graveyard and this did not allow a sufficient amount of time and experience for students to attain the objectives of the activity. See Figure 4.

For the survival section, the experimental participants again had a greater range of mean scores prior to and following the outdoor school experience than the control group because their pretest mean score was lower and their posttest mean score was higher. The actual numerical value of the range was the greatest for any of the test sections. One explantion for the higher posttest scores and amounts of gain on this section is that this activity, unlike the others, required the students to carry out written instructions and perform several tasks without the assistance or verbal instruction of the counselor-teacher. See Figure 5.

On the test as a whole, the range in mean scores from pretest to posttest for both the control and experimental groups is relatively small in comparison to possible increases for both of over 45 points. See Figure 6.

The fact that only very small arithmetic differences between the control and experimental group total scores were observed is contrary to expectation because not all members of the experimental group participated in all of the activities for which objectives were tested. It is possible, however, that communication among the students may account for the observed increase in scores for those students who did not actually participate in the activities.

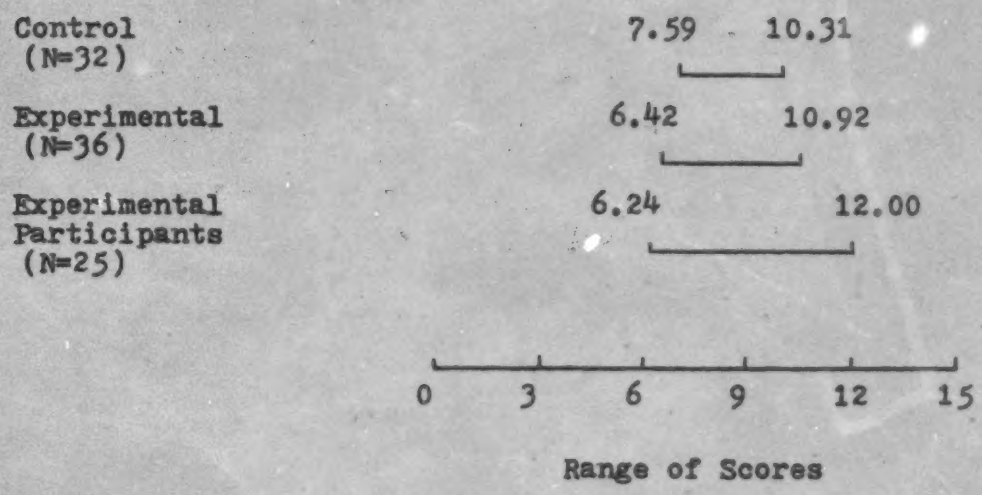

Figure 5. Range of Mean Measures of Attainment of Survival Objectives

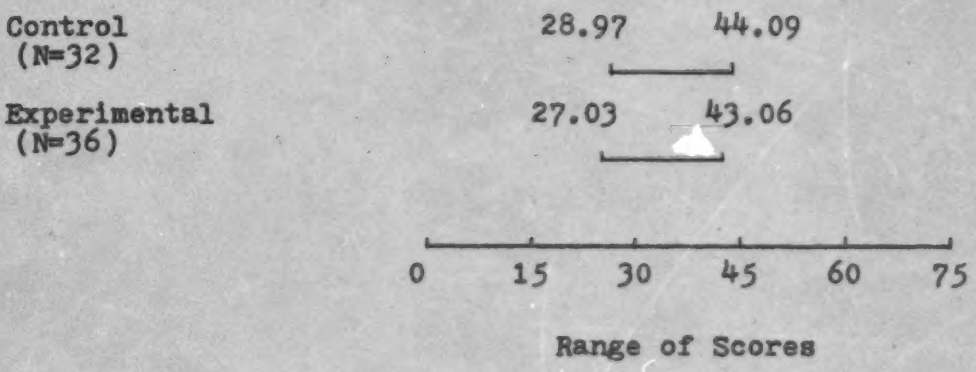

Figure 6. Range of Mean Measures of Attainment of Objectives for All Activities

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study was conducted for the purpose of determining what effect choice of participation in learning activities has upon the attainment of the behavioral objectives specified for those activities. Presented in this chapter are summaries of the procedures and the findings of the investigation, conclusions, discussion and implications, and recommendations for further research.

Summary of Procedures

The first step in the development of the program was to plan the objectives and activities based on information from the classroom teachers. Once the objectives and activities were developed, they were scheduled into the outdoor school program in two different ways. Under one schedule, that which is usually followed and the one in which the control group participated, only one activity was offered during each learning activity period. All of the control students participated in the same activity at the same time and were given no choice of activities. Under the other schedule, in which the experimental group participated, four different activities were offered during each activity period and students were allowed to choose the one in which they would participate each period.

The instrument used to measure the attainment of the objectives was a written, objective test which consisted of ten questions, all of which were based directly on the objectives of the activities. It was administered to the subjects in their classrooms during the week before and during the week after the outdoor school experience. For purposes of making comparisons, the test was scored by sections, each section consisting of questions covering a different content area. Comparisons were made between the entire control group and the entire experimental group and between the entire control group and members of the experimental group who had participated in the activity for which objectives were tested. Comparisons were also made within each group between pretest and posttest scores.

Summary of Findings

The results of the study may be summarized as follows:

1. Significant gains on all sections of the test were made by all of the groups with one exception. The control group failed to exhibit a significant increase in attainment of objectives from pretest to posttest on the section which tested for the objectives of the trip to the graveyard.

2. There were no significant differences between the measures of attainment of the objectives for the experimental group, who were given a choice of activities, and

the control group, who had no choice, prior to the outdoor school experience. The same was also true for the measures of attainment for the control group and the experimental participants.

3. There were no significant differences among the measures of attainment of objectives for Classes A, B, and C within the experimental group or within the groups of experimental participants for the activities prior to the program. The only significant difference found among the three classes within the control group occurred on the section which tested for the objective of the trip to the graveyard.

4. There were no significant differences between measures of attainment of objectives for the control group, who had no choice of activities, and the experimental group, who were given a choice of activities, following the Stone Valley program. Also there were no significant differences between the measures of attainment for the control group and the experimental participants, those members of the experimental group who actually participated in the various activities.

5. No significant differences were found among the measures of attainment of the objectives of Classes A, B, and C within the control group, within the experimental group, or within the groups of experimental participants for each activity following the outdoor school experience.

6. Tests for significance of difference between groups in the amount of change in attainment of objectives from pretest to posttest yielded only one significant value. The amount of change for the experimental participants, who chose and participated in the activity, was greater than the change for the control group, who had no choice, on the test section covering the survival objectives.

Conclusion

On the basis of the results of this study and within the limitations thereof, the following may be concluded: although significant learning takes place, allowing students in a resident outdoor education program to choose from several alternatives the activities in which they participate has no greater effect upon their attainment of the objectives for the activities than not allowing them a choice. The hypothesis for the study, that students given a choice of participation in activities exhibit greater attainment of the objectives for the activities than students who are given no choice, must be rejected.

Discussion and Implications

1. There are several reasons which may account for the fact that no significant differences were found between the control subjects and those students who were allowed to choose their activities:

a. It is possible that choices of activities made by the students in the experimental group were not based on interest, but rather on the desire to be with friends or to be able to go wherever the activity was being conducted.

b. The length of time for the study may have been too short for any noticeable change to be detected. The studies of Frandsen and others (14,15, 16) and of Barrilleaux (3) found achievement related to interests among high school students who had had time to develop interests and pursue them academically.

c. It is also possible that the interests of the control group in the activities was higher and, therefore, their attention during the activities and their learning was as great or greater than that of the experimental group.

d. The nature of the outdoor school program itself may account for some of the lack of differences shown. The activities are quite different from those in a classroom, allowing students a greater opportunity to discover and question for themselves, and as Smith et al. (29) contend, this method of direct learning is more effective than classroom situations in which much of the learning is dictated by the teacher.

e. Results of the testing following the program may have been influenced by previous knowledge of the test due to administration of the same instrument prior to the outdoor school experience.

f. The fact that counselor-teachers were allowed no choice of activities which they led may have influenced their interest and effort which, in turn, may have influenced the interest, attention, and cooperation of the students in carrying out the activities.

2. The use of behavioral objectives in developing and evaluating the learning activities was effective in that they clarified for both the staff and the students the specific learning that was to take place. The fact that students, as a whole, received significantly higher scores on a test designed specifically to measure attainment of the objectives of the activities in which they participated offers good support for the contention that behavioral objectives are valuable educational tools which can and should be applied in outdoor education programs.

Recommendations for Further Research

To further investigate the problem proposed in this study, it is recommended that the following be considered:

1. Extend the length of the program, possibly by including activities on the school site or field trips prior to and following the resident experience.

2. Run the program at two different camps simultaneously with the control program schedule followed at one camp and the experimental schedule at another.

3. Survey the students to determine their interests and develop activities based on them. Implement these

activities in a resident program with others in which students have not shown interest, and compare the learning in the activities under conditions of choice and no choice.

4. Run each of the program schedules on different weeks with different subjects, but using the same staff and facilities.

5. Run an experimental program which involves the students in decision-making throughout the entire schedule and not just during the learning activity periods.

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APPENDIX A

THE DAILY SCHEDULE

PROGRAMS OF ACTIVITIES

THE DAILY SCHEDULE

MORNING

7:15	Wake Up
7:45	Hoppers, Flag Raising
8:00	Breakfast
9:30	Morning Activity Period
11:45	Hoppers
12:00	Lunch

AFTERNOON

1:00	Quiet Time
2:00	Afternoon Activity Period
4:15	Free Time
5:15	Hoppers
5:30	Supper

EVENING

6:30	Log Time (With Teachers)
7:30	Evening Activity
8:45	Snacks and Campfire
9:30	Bedtime

SCHEDULE OF LEARNING ACTIVITIES
FOR THE CONTROL GROUP

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning Arrival Orientation Discovery Hike	Morning Forest Plants	Morning Water Ecology	Morning Survival Simulation
Afternoon Action Socialization Experience	Afternoon Graveyard Map and Compass	Afternoon Apartment Hunting	Afternoon Departure
Evening Dusk Hike Astronomy	Evening Barn Party	Evening Orienteering Race	Evening

SCHEDULE OF LEARNING ACTIVITIES
FOR THE EXPERIMENTAL GROUP

TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning Arrival Orientation Choose Activities for Afternoon Discovery Hike	Morning ASE Water Ecology Block of Soil/ Terrarium Toothpick Hunt/ 100" Hike	Morning Apartment Hunting Forest Plants Toothpick Hunt/ 100" Hike Homestead	Morning ASE Fossil Hunt Homestead Orienteering Race
Afternoon Apartment Hunting Water Ecology Graveyard/ Map & Compass Perception Points	Afternoon Forest Plants Survival Simulation Perception Points Block of Soil/ Terrarium	Afternoon Graveyard/ Map & Compass Survival Simulation Fossil Hunt Water Ecology	Afternoon Departure
Evening Parachute Astronomy	Evening Barn Party	Evening Dusk Hike	

APPENDIX B

THE LEARNING ACTIVITIES

Activity: Water Ecology

Objectives: By the end of the activity the student should be able to

1. classify macroscopic water plants as being floaters, emergents, or submergents;
2. describe one structure characteristic of the plants in each class that determines why the plants are put in their class;
3. list three ways in which plants may be used by animals in a water environment.

Materials: Field microscopes, hand lenses, mud scoops, strainers, small collecting jars, resource books.

Description: The activity begins in the lodge with a brief presentation given by a member of the staff. The introduction will include a discussion, supplemented by diagrams, of habitats and horizontal strata in an aquatic environment and classification of plants as floaters, emergents, or submergents. Following the discussion each group will be led by its counselor-teacher to the marsh or boat cove. At the water students will first make observations of the variety, abundance and location of the plant and animal life. While making these observations, the counselor should discuss with the group which of the plants seen could be classified as floaters, which as emergents, which as submergents. Three students should then obtain samples of plants in each class. With the group standing in a circle the plants should be held out for observation, and the structures (roots, stems, leaves) should be compared. The group should discuss which of the structures help determine what class the plant is put into--how all the plants of the same class are alike. Students should then search individually among the plants for animals. The hand lenses and microscopes should be used for close observation and students should be encouraged to share their discoveries. After a good variety and number of animals have been found, discuss similarities and differences and habitats from which each kind was taken. Based on observation and previous knowledge, students should discuss how the animals derive benefit from the plants.

Activity: Forest Plants

Objectives: By the end of the activity the student should be able to

1. identify three edible wild plants and state which part(s) of those plants may be eaten;
2. identify two plants that may be used by man or animals for something other than food and state the specific use(s) of each.

Materials: #10 tin cans, field guides.

Description: The activity begins in the lodge with a brief presentation by a member of the staff. The purpose ot the presentation will be to discuss characteristics of plants and how plants can be identified through observation of their characteristics. The counselors will then take their groups outside and do the following:

1. Take a short walk through the field and into the woods to identify and collect edible wild plants.
2. On the walk observe and identify wild plants of specific use to man and/or animals for things other than food.
3. Bring the edible plants to the fire circle, prepare them according to the field guide, and eat (at least taste a bite of each).

Field Guide to
Common Plants of Stone Valley

Dandelion
Found abundantly, mostly in open fields
Thick root, no stems, leaves with deeply toothed margins, flowers yellow
Edible: gather young leaves when they first appear (before flowers appear), eat raw as salad greens or boil in water as a potherb; gather roots in early spring when leaves first appear, chop and boil in water, change water two or three times, add salt, pepper, butter

Wild Strawberry
Found abundantly in dry soil, mostly in open fields
No stem, leaves arise from underground runners, each leaf composed of three leaflets with regular toothed margins, flowers white
Edible: gather berries when ripe, eat raw or cook in pies

Land Cress (Field Cress)
Found in fields and meadows
Leaves in rosette at base, leaf margins irregularly indented
Edible: eat leaves raw, great for salads

Mayapple
Found in dense groups in moist wooded areas
Thick stems, 1-3 umbrella-like leaves with 5-9 large lobes
Edible: ripe fruit, eat raw or extract juice

Wild Leek (Wild Onion, Wild Garlic)
Found abundantly in fields, meadows
Long, cylindrical leaves, round, thin stems, bulb at base
Edible: bulb at base of stem, eat raw or cooked

Wild Carrot (Queen Anne's Lace)
Found in fields and meadows
Tough, thick tap root, basal leaves finely divided--look like parsley; in second year, develop long stem, white flowers in umbels
Edible: root, eat raw or cooked

Cattails
- Found in marsh areas
- Roots thick and run horizontally, leaves long and smooth
- Edible: roots, wash and peel outside, dry and make into flour; young leaves, when two feet high pull inside leaves--tender white part near base can be eaten raw or cooked
- Usefulness to man: long basal leaves used to make rush seating for chairs
- Usefulness to animals: stalks used by muskrats to build homes

Yarrow
- Common in pastures, open areas
- Young plants seen as rosette of leaves on ground, older plants have stems 1 to 2 ft. high, white flowers in clusters, leaves are finely divided, often mistaken for ferns, also easily confused with wild carrot--can tell difference by smell
- Not edible
- Formerly used to put on open wounds (cuts)

Cinque-Foil
- Found in open areas in woods and at edge of woods
- Underground runners, stems 6 in., leaves composed of 5 leaflets, flowers yellow, may be mistaken for wild strawberry
- Not edible

Thistle (several varieties)
- Common in fields, pastures
- Leaves with many lobes, margins may have spines, leaves often covered with soft hairs
- Edible: young stems of Canada Thistle, boil in salted water; young leaves of Sow Thistle, boil, salt
- Usefulness: used by a few bird species--tiny hairs on leaves used to line nests

Reindeer Moss
- Common in wooded areas, bare soil
- A lichen--composed of an alga and a fungus
- No true stems, leaves or roots; grayish-green in color, structure is a finely divided, branched mass of spongy material which looks like a pile of miniature antlers
- Not edible
- Usefulness: used by man when it is dry to start fires

British Soldiers
Common on bare soil, edges of woods
A lichen
Small stem-like structures, grayish-green topped with red
Not edible
Good plant for a terrarium

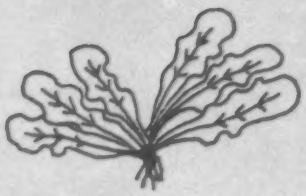
Bedstraw
Common in wooded areas, thickets
Stems four-sided and have bristles, leaves in whorls along stems, flowers white
Not edible
Said to be used in former times by young girls about to be married for stuffing pillows and mattresses

Plantain
Found in grassy fields
Short rootstalk, no stem, leaves oval, close to ground, have several conspicuous veins running parallel from base to tip
Edible: leaves, eat raw or cooked; dried leaves used as a substitute for tea

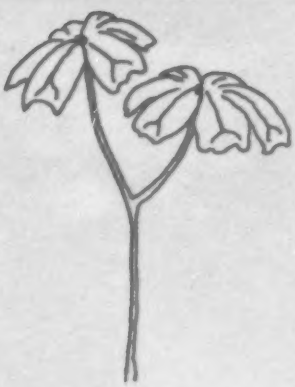
Winter Cress
Found abundantly in fields and waste places
Stem up to 2 ft. high, leaves have one large lobe on end, several smaller lobes toward base, flowers yellow in clusters on top of stem
Edible: young leaves, boil in water, drain, boil again

Dandelion

Cinque-foil



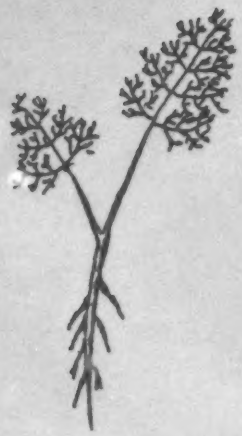
Land Cress



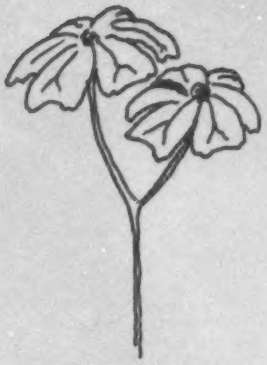
Mayapple

Wild Leek

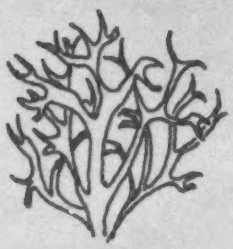
Yarrow



Wild Carrot



Mayapple



Reindeer Moss

Thistle

Cattails

British Soldier

Activity: A Trip to the Graveyard

Objectives: By the end of the activity the student should be able to

1. construct a family tree based on inferences made from data collected from tombstones in a graveyard;
2. estimate a given distance using the pacing method;
3. list in order the procedures one would follow in using a map and compass to find the direction of travel from one place to another;
4. calculate the distance from one point to another on a map by using the scale.

Materials: Graveyard data sheets, family tree sheets, topographic maps, compasses, pencils, pacing ropes.

Description: The activity will be introduced by a staff member who will demonstrate how to diagram a family tree and will discuss procedures for the hike to and activities in the graveyard. At the site each group will do the following:

1. Go into the graveyard and fill out a graveyard data sheet with information from the tombstones.
2. Complete the family tree sheets.
3. Have each person determine his or her pace, then estimate several distances designated by the counselor.
4. Use the compass and topographic map to determine the direction and distance the group must travel to return to the lodge by going cross-country.

Graveyard Chart

NAME	BORN	DIED	AGE

Use the information you have collected to answer the questions below.

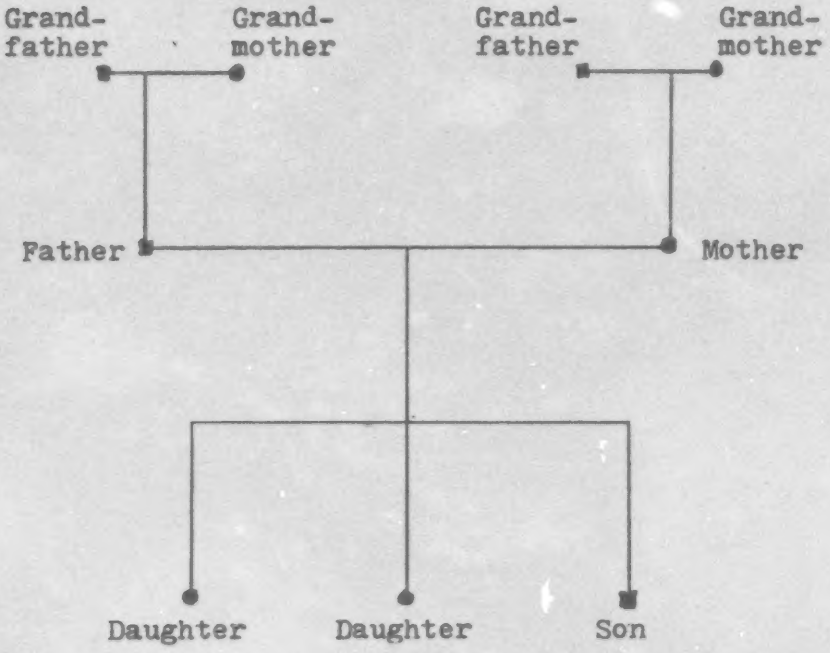
Which person died at the oldest age? _____

Which person died at the youngest age? _____

On the back of this paper try to make a family tree for the people buried in this graveyard. First decide what information you will need to use, then use it to determine the relationships among the people.

Family Trees

A family tree is a diagram that shows how the members of a family are related. A simple family tree might include children, parents, and grandparents. The form of the diagram looks like this:



On the back of this sheet of paper, make a family tree for your family. On the tree include yourself, your brothers and sisters (if you have any), your parents, and your grandparents. Be sure to write the name of each person in the proper place--don't use just grandmother or son or father, etc. If you know them, put the years in which the people in your family were born below your tree.

Activity: Survival Simulation

Objectives: By the end of this activity the student should be able to

1. list the three essential needs a person must satisfy in order to survive (water, warmth, food);
2. name or describe at least two sources or means of obtaining water, food, and warmth in the wilderness.

Materials: Matches, poncho, twine, pocket knives, trash can liner, tin can, shovel, Clorox, topo map, compass.

Description: The activity will begin with a short discussion indoors led by a member of the resource staff. Each group will then be led by its counselor to a place in the woods from which the lodge cannot be seen. At this place the counselor will announce to the students that they are "lost". The group will then discuss what they should do in order to survive--how they will get water, food, and warmth, and who will be responsible for obtaining these things. Each person should then fulfill his responsibilities. When these things are done, the counselor and the group should sit down and discuss ways in which they got what they needed and how they might have done things differently. Following this the students will use the map and compass to find a direction and return to the lodge.

INSTRUCTION SHEET

Sit down in a circle. Choose a leader for your group. Let the leader then read this page of instructions. Read this entire page all the way through before you do anything else.

In order to survive you must complete the following tasks:

1. You have been given a jug of water in your pack--pretend the water came from a stream. Since you are unsure of its purity use the liquid bleach in your survival kit to purify it. Use 2 drops of bleach for each pint of water. (2 cups=1 pint; 2 pints=1 quart; 4 quarts=1 gallon) Determine how many drops you need, add them to the water, and let the water stand for fifteen minutes before drinking. (The water is made safe for drinking by the chlorine in the bleach, much the same as water is made clean for swimming by adding chlorine.)

2. Since you may need water later, construct a solar still to collect water from the air. Dig a hole 2 feet long and 1 foot wide. Place some kind of container in the hole, then cover the hole with a sheet of plastic and put rocks on the four corners to hold it down. Put a few stones in the middle of the plastic so that it slopes over the container.

3. In order to provide heat you will need to build a fire. Gather wood and any other suitable materials and stack a good supply at your site. Start a fire and keep it going for as long as you are out here.

4. In order to provide protection from bad weather that might arise, construct some kind of shelter. Select a spot near you that offers the best protection from wind. Use the ponchos and twine and/or other useful materials.

5. You'll probably be getting hungry soon. Scout the area and find what edible wild plants are available. Don't eat what you find, but let each member who would like to take a small bite to taste.

Before you begin, decide as a group if everyone will do everything or if some people will do one thing while others do another. Be sure you have a plan of action before you start.

When finished, put your fire out. Ask your counselor for directions back to the lodge and return there.

Activity: Action Socialization Experience (ASE)

Objective: Through these experiences small groups of students will cooperatively decide on solutions to carefully designed problems and then carry out their plan of action for each problem as quickly and efficiently as possible.

Description: An ASE is a problem-solving situation which stimulates immediate participation in a group activity. The ASE course consists of six different stations: the electric fence, quicksand, the maze, stretcher case, team on a T-shirt, and the beam. At each station the counselor explains the set-up and objective for the task to be done. The students are allowed fifteen minutes in which to arrive at a solution and successfully implement it. At the completion of each attempted solution, the counselor discusses with the group how well they worked with one another and what they might do to improve their efficiency on the next task.

ACTION SOCIALIZATION EXPERIENCE (ASE)

Purpose

An ASE is a problem-solving situation which stimulates immediate participation in a group activity. These experiences provide opportunities for small groups of students to cooperatively decide on a solution to a carefully designed problem and then carry out their plan of action as quickly and efficiently as possible. As a result, the students' self-confidence and pride are bolstered on the immediate and successful completion of the tasks.

Description

Since each ASE has a different set-up and objective, each will be explained separately on this and subsequent pages.

Mechanics

At the ASE site, each group will go to a different station. At his group's station, the counselor-teacher will explain the set-up and objective for the task at that station. The group will then be given fifteen minutes to complete the task, after which they will go to another station. The counselor-teacher should be sure to emphasize to the group the importance of working cooperatively toward completion of the task within the time allowed.

Electric Fence

Equipment

1 -- 15-foot length of rope (any diameter)
2 -- trees, 8-10 feet apart
1 -- 4 to 6 inch diameter log, 5 feet long

Set-Up

Tie the rope between the trees at a height of 3 feet (higher for older children and adults) to simulate a fence. On the ground mark boundary lines parallel to and five feet from each side of the rope.

Object

To get the entire group over the fence without touching it in any way. Should anyone touch the fence or trees the entire group must start again. Once over the fence, a person may not walk around the trees to come back and help.

Safety Procedures

Spotters should stand on the side of the rope opposite where the students are jumping.
Students who have not gone over the fence should spot from behind.

Quicksand

Equipment

1 -- 20-foot length of rope, 1-inch diameter
1 -- 10-foot length of rope, ½-inch diameter
1 -- 5-foot long log, 6-inch diameter
1 -- large tree with sturdy branch 20 feet up

Set-Up

Suspend the 1-inch rope from the branch of the tree. Vigorously swing the rope several times to determine the maximum arc and mark boundary lines at the extremes. Place the ½-inch rope and the 5-foot log behind one of the boundary lines.

Object

To get all members of the group and the log across the quicksand (space between boundaries) without touching the sand. If anyone or the log touches the quicksand, everything must be brought back and placed as it was set up and the group must begin again.

Safety Procedures

Spotters should be strategically placed to prevent anyone from swinging into a tree.
No one should be permitted to tie himself to the swinging rope.

Beam

Equipment

1 -- 12-inch diameter log, 10 feet long
2 -- sturdy trees, 6-8 feet apart

Set-Up

Securely lash the log between the trees so that the bottom of the log is 5 to 6 feet above the ground. Make boundary lines parallel to and five feet from each side of the log.

Object

To get each member of the group from one boundary line, over the beam and across the other line as quickly as possible. If the trees supporting the beam are touched the entire group must begin again.

Safety Procedures

Students should stay clear of the landing area to avoid being jumped on.

Maze

Equipment

300 feet of binder's twine or light rope
1 blindfold for each group member
A small grove of trees reasonably close together

Set-Up

String the rope through the trees at waist level in a zig-zag pattern to make a maze. Leave a small space between two trees as an exit. Blindfold all the group members a short distance from the maze. Have them hold hands and lead them into one corner of the maze.

Object

To find the exit to the maze in the shortest time possible. Once a person is outside, he may remove his blindfold and verbally direct the others to the exit.

Safety Procedures

The ground within the maze should be as free from rocks and other obstacles as possible.

Team on a T-Shirt

Equipment

1 -- T-shirt or smaller piece of cloth depending on size of group

Set-Up

Place the T-shirt on the ground in a relatively open area.

Object

To get everyone standing on the T-shirt for at least 10 seconds at one time so that no one is touching the ground except with the foot or feet that also touch the T-shirt.

Stretcher Case

Equipment

2 -- 1 to 1½-inch diameter poles, 6 to 7 feet long

Set-Up

Lean poles against tree at beginning of short trail.

Object

To make a stretcher using available materials (natural and manmade) and transport a victim over a series of obstacles (trail) to be determined by the site. The victim is presumed to be unconscious and therefore cannot hold onto the poles.

Safety Procedures

Care should be taken to insure that the victim in the stretcher is not dropped or roughly handled.

The ideas for this activity are borrowed from Jim Merritt at the New Jersey School of Conservation, Branchville, New Jersey.

Activity: Acclimatization--Apartment Hunting

Objectives: By the end of this activity the student should be able to

1. recognize and differentiate natural objects and sounds by the use of his senses, excluding the sense of sight;
2. identify different strata in a forest by comparing them with levels in an apartment building;
3. describe how each level in a forest represents a different kind of habitat for animals living there.

Materials: Blindfolds, ropes.

Description: The activity will begin with a short discussion on the use of the senses. Each group will then be led into the woods by its counselor. During part of the walk the students will be blindfolded in order to heighten awareness of their other senses. While they are blindfolded they should be given things to feel and smell and should be made to stop and listen for different sounds. The counselor should lead the group to a large tree, preferably one with animal signs such as nests, holes, and galls on its trunk and branches, and guide each student to a spot around the base of the tree and have him or her lie down. When all students are laying down (arranged like spokes of a wheel) have them remove their blindfolds and quietly look up. Compare the forest to an apartment house by having them dig into the earth (basement), scan the forest floor and observe the activity (ground floor), look up the trunk and through the lower branches (upper floors), at the very tops of the trees where the birds live (penthouse--where singers and flashy dressers live), and finally at the light breaking through the leaves (skylight). Discuss how each level represents a different kind of place for an animal to live--how each level is different from the others, what kinds of animals you would expect to find at each level. As you return to the lodge the students should try to locate with their eyes the things they touched when they were blindfolded.

Activity: Block of Soil

Objectives: By the end of this activity the student should be able to

1. sort plants into groups and state the characteristics which plants in the same group have in common;
2. determine some of the irreversible detrimental effects that man can have upon the natural environment.

Materials: Shovels, plastic sheet, hand lenses.

Description: The counselor will explain to the group that they are going to pretend that they are scientists from another planet sent to earth to examine its soil and life forms. Have the children get into small groups of two or three and give each group a shovel, a plastic sheet, and two hand lenses. Lead the groups into a field or wooded area and have them dig up a block of soil intact (about 1 foot square, 6 to 12 inches deep) and place it on the plastic sheet. Each group will then carefully sort out all the living things and non-living things and sort them into groups. The counselor will discuss with the students why they have sorted the plants as they have--what characteristics allowed them to classify the plants as belonging together. The students should then be asked to try to sort the plants into different groups and explain their reasons for the new groupings. When the discussions are finished the counselor should instruct the children to put the block back together again exactly the way they found it.

When the children realize that the things from the block cannot be put back exactly as they were found, the counselor should discuss with them the role man plays in harming the environment. Ask the children what they could do with the materials and after discussing possibilities have each small group construct a terrarium using the materials from the block (to take back to their planet for further study). Replace all of the remaining soil and plants and animals back into the hole created when the block of soil was removed.

Activity: Toothpick Hunt

Objective: By the end of this activity the student should be able to

1. suggest appropriate colors and/or markings for animals living in the environment and explain them in terms of predator-prey relationships when presented with a colored or patterned background (habitat).

Materials: 400 colored toothpicks.

Description: Scatter exactly 400 toothpicks over a grassy area before the activity is to begin. Have the students assemble and discuss with them that they will be looking for differently colored toothpicks that have been scattered in the grass. Have them hunt for the toothpicks for about five minutes, then stop them and collect all those which have been found. Have them continue to look for the toothpicks for another ten minutes. At the end of this time have them count how many of the toothpicks of each color they found after the first five minutes and then how many after the next ten minutes. Discuss what numbers were found and why there are varying amounts after the first five minutes and after the entire fifteen minutes. After this have them suggest some hypotheses to explain the results. Let them select the hypothesis they would like to test. Have them develop an "if ... then ..." statement. (For example, if a caterpillar is green then we should find it on a green leaf; if we look in specifically colored or patterned areas, then we will find only those organisms that match that area and they won't be easy to see at first.) This same procedure could be carried to a new environmental setting; for example, scatter the toothpicks under a pine tree.

Follow up the toothpick hunt and hypothesis statements with an animal color hunt (100-inch hike). Have the students collect observations that would support or oppose their hypothesis. Near the end of the time period have the children present their findings and discuss whether their hypothesis was supported or not. Have them carefully look at the data and note whether there are any discrepant pieces of information. Have them modify their hypothesis or develop a new one that will fit all of their data.

Note: There should be 100 toothpicks of each of the following colors: brown, red, orange, and green.

Activity: One Hundred-Inch Hike

Objectives: After the activity the student will be able to

1. explain and/or give examples of the difference between observations and inferences;
2. list two examples of animals that have body coloration that protects them in their habitat.

Materials: Hand lenses.

Description: The activity will begin in the field. Have the children form a circle, then explain to them that they are going on a very special kind of hike. On this hike they will take the role of a very small animal living in the field and will be trying to find other animals in the area. Then have the students form a straight line and get down on their hands and knees (unless it is too muddy) and crawl very slowly through the grass. When something is found, have everyone stop and look at it. Discuss what kind of body covering it has--shape, texture, color. Does it have legs? Can it fly? Was it easy to spot in the place it was found? Look for pieces of dead and decaying plants and animals. Discuss the possibility of how pill bugs and bacteria and worms might be helpful in the process of decay. Look for animals that are feeding on plants. Try to find out how the animals breathe. After traveling 100 inches in one type of area, go to another and begin again. Make comparisons. Discuss what inference could be made based upon the data collected.

Activity: Homestead (SV)

Objectives: By the end of the activity the student should be able to

1. identify articles around old homestead foundations which provide evidence of the approximate date (time) that the homestead was used;
2. make inferences about the life style of the people who lived in the homestead, based upon the kinds of articles found.

Description: Counselors will lead their groups to the homestead site at Stone Valley. At the site students should freely explore in and around the foundations for any articles which might provide clues about the history of the homestead and the people who lived there. After their search, the group should discuss what was found and what one might infer based on the evidence found.

Activity: Perception Points

Objectives: Through this activity the student should be able to

1. improve his or her ability to use a compass for finding direction from one point to another;
2. use his or her senses more fully to make observations of details in the natural environment.

Materials: Compasses.

Description: The perception points course consists of eleven different locations within an area of approximately five acres. At each location there is a numbered marker and a container which holds a question for the participant to answer. The questions ask for information which must be obtained by making detailed observations of some specific object in the natural environment. To travel from one location to the next, the student must use a compass and follow the bearings given on a direction card. Answers to questions are recorded and returned to the counselor.

Activity: Fossil Hunt

Objective: By the end of this activity the student should be able to

1. find and identify common fossil imprints in shale rock.

Materials: Rock hammers, safety goggles, field guide.

Description: Students will hike with their counselor-teacher to the fossil bed near the spillway at the end of the Stone Valley lake. Using rock hammers and wearing safety goggles, students will break apart and inspect fragments of shale for fossil imprints. Students should identify the imprints using the field guide books and check with the counselor-teacher for confirmation of their identification.

Activity: Orienteering Race

Objective: By the end of the activity the student should be able to

1. improve his speed and accuracy in using a compass to find a bearing.

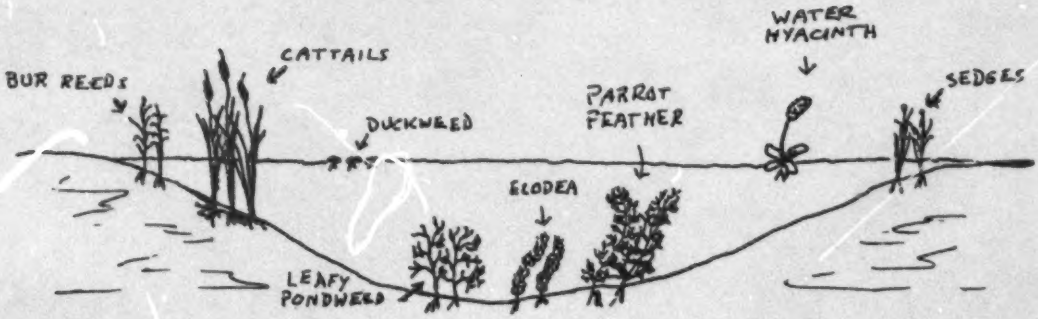
Materials: Compasses, direction cards.

Description: An orienteering race is an activity in which the students compete to move through a series of checkpoints by following compass directions. Each is given a set of directions (bearings) and the distance between each two checkpoints. He is also given a pencil and is required to record the letter found on the marker at each checkpoint. Starting and finishing times are recorded and the shortest time wins.

APPENDIX C

THE TEST INSTRUMENT

THE SCORING KEY



1. Look at the plants in the picture above. Think of some way that you could put these plants into three groups. Now write the names of the plants which go together -- put those in the first group under number 1, put those in the second group under number 2, and put those in the third group under number 3. Be sure that you put each plant in only one of the groups.

1	2	3

2. Next to the number of each group listed below (the same as the groups you made in the first question), tell one or two ways in which all of the plants in the same group are alike.

Group 1

Group 2

Group 3

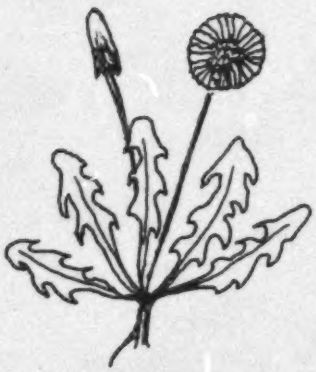
3. List three different things which plants can provide for animals that live in the water.

1.

2.

3.

4. Circle three of the plants below that can be eaten by people. Under the name of the plant, tell which part or parts of the plant can be eaten (roots, stems, leaves, flowers, or fruit).



Dandelion

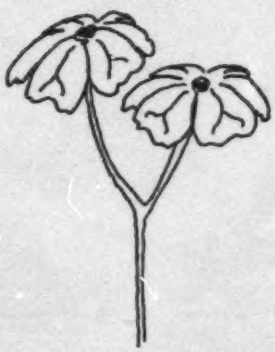
_____

Cinque-Foil

_____

Land Cress

_____



Mayapple

_____

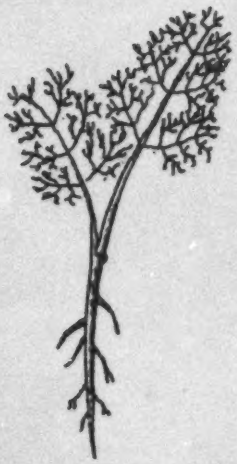
Wild Leek

_____

Yarrow

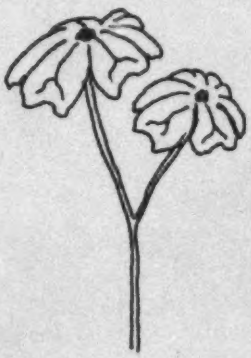
_____

5. Circle two of the plants below that can be useful to man or animals for something besides food. Under the name of each one you circle, write what it can be used for.



Wild Carrot

_____



Mayapple

_____

Reindeer Moss

_____

Thistle

_____

Cattails

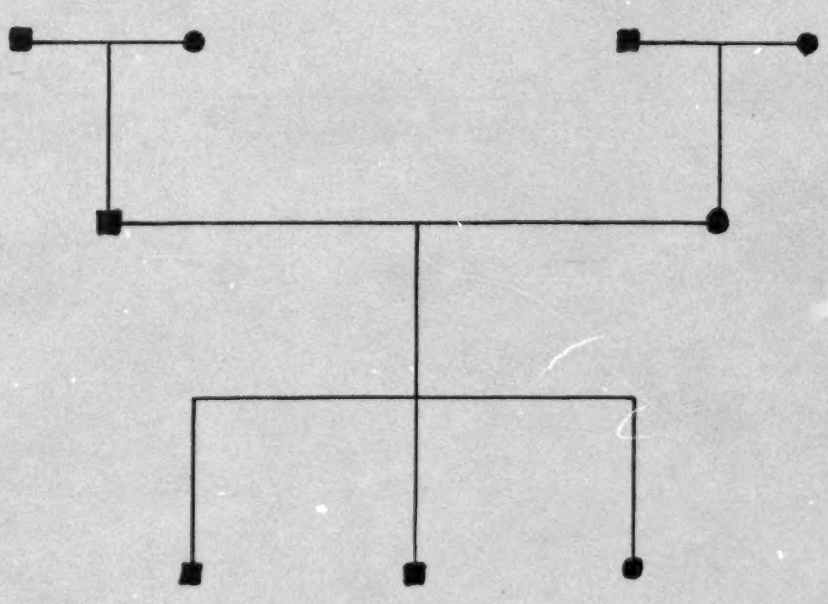
_____

British Soldier

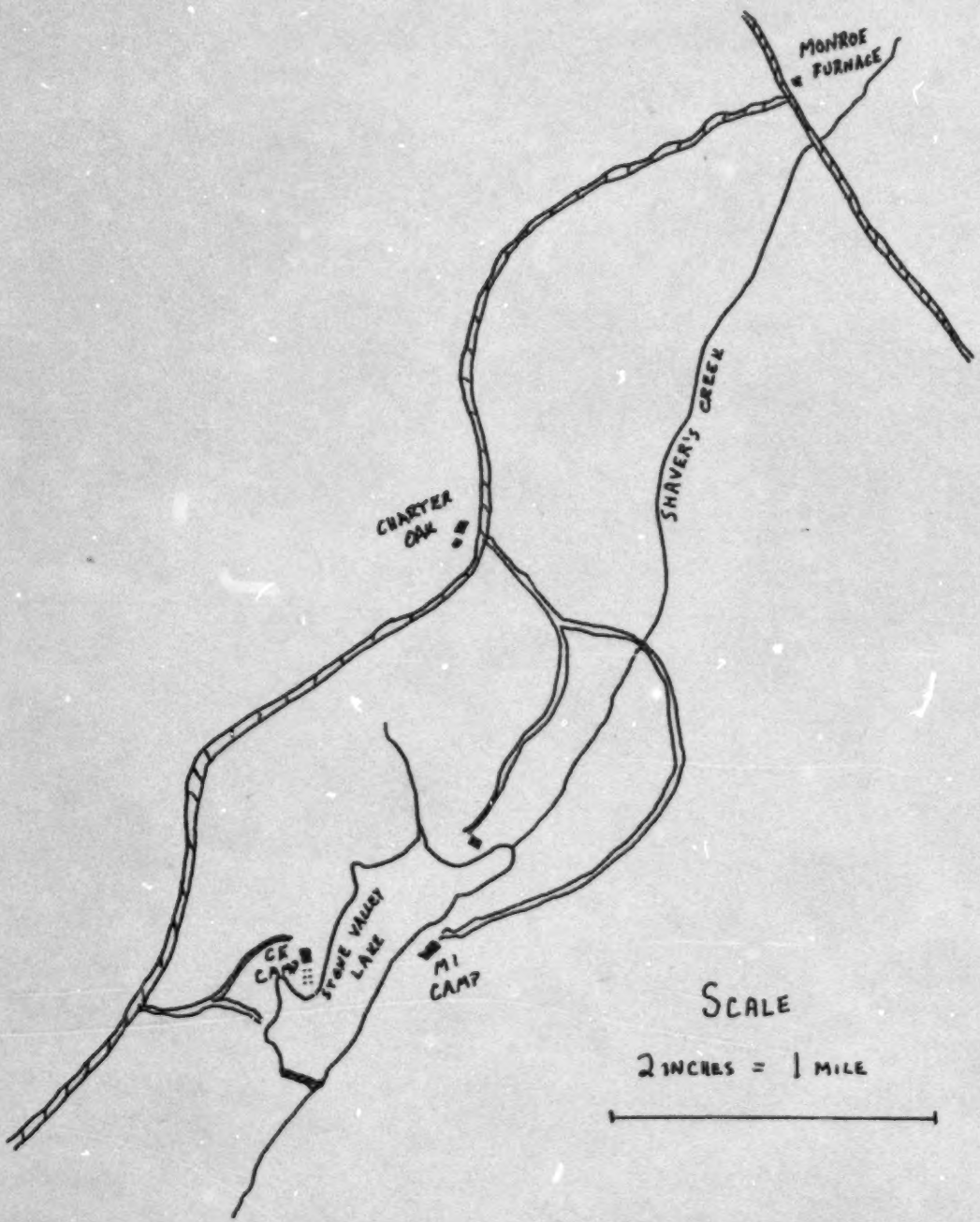
_____

6. Below is some information that you might take from tombstones in a graveyard. Use this information to complete the family tree drawn below by putting the names of the people next to the circles (for girls or women) or the squares (for boys or men) where they belong.

Name	Born	Died	Age
James Carter	1842	1890	48
Joseph Carter	1817	1860	43
Elizabeth Grove	1846	1880	34
Mary Beth Carter	1864	1920	56
George Grove	1810	1872	62
James Carter	1872	1929	57
Sarah Carter	1817	1861	44
Sally Grove	1817	1870	53
Robert Carter	1874	1935	61



7. Look at the map below. Suppose you wanted to go from CE Camp to Monroe Furnace. If you could fly or walk straight there, how far would you go? _____



8. In the space below is a list of 2 of the 3 steps you would use to find your direction from one place to another by using map and compass. Next to the letter c. write in the step that is missing. (In other words, tell what else you would need to do to find your direction of travel.)

   a. Orient your map toward north--turn it so that the top is facing north when it is laying flat on the ground.

   b. Draw a line between the place where you are and the place where you want to go. Lay your compass on the map so that one of the longer sides is right on the line you have drawn. Make sure that the direction of travel arrow is pointing toward the place where you want to go.

   c.

9. From the list below circle the three things a person must have in order to survive in the out of doors.

   food fire water tent

   light knife warmth

10. From the list below, check two different ways that you could get water that is safe for drinking in an outdoor area where there are no pumps or wells or water faucets around.

   ____ Get water from a stream or pond or puddle and add chlorine to it (by using household bleach like Clorox).

   ____ Find a clear stream and dip out water from the part of the stream that is moving the slowest.

   ____ Collect water from the air by laying a piece of plastic over a hole in the ground and letting water collect on the inside.

   ____ Put wet leaves and plants in a T-shirt and squeeze them until all the water runs off.

   ____ Cut the stems of wild plants and suck the juice.

SCORING KEY

1. 2 points for each correct group.

Group 1	Group 2	Group 3
Bur Reeds	Duckweed	Elodea
Cattails	Water Hyacinth	Leafy Pondweed
Sedges		Parrot Feather

2. 2 points per group for listing of characteristic(s).

Group 1 Rooted in ground under water, stems rigid, stems project above water surface.

Group 2 Roots hang freely in water, leaves generally flat and on or close to water surface.

Group 3 Rooted in ground under water, stems flexible, leaves flexible, plants entirely under water.

3. 1 point for each correct answer.

oxygen (air)

food

protection (shelter, homes, camouflage)

4. 1 point for each correct plant circled; 2 points for each correct listing of edible part(s).

Possible answers:

Dandelion -- roots, stems, leaves, flowers

Land Cress -- leaves

Mayapple -- fruit

Wild Leek -- stem, bulb at base

5. 1 point for each correct plant circled; 2 points for each correct description of use(s).

   Possible answers:

   Wild Carrot -- dyes

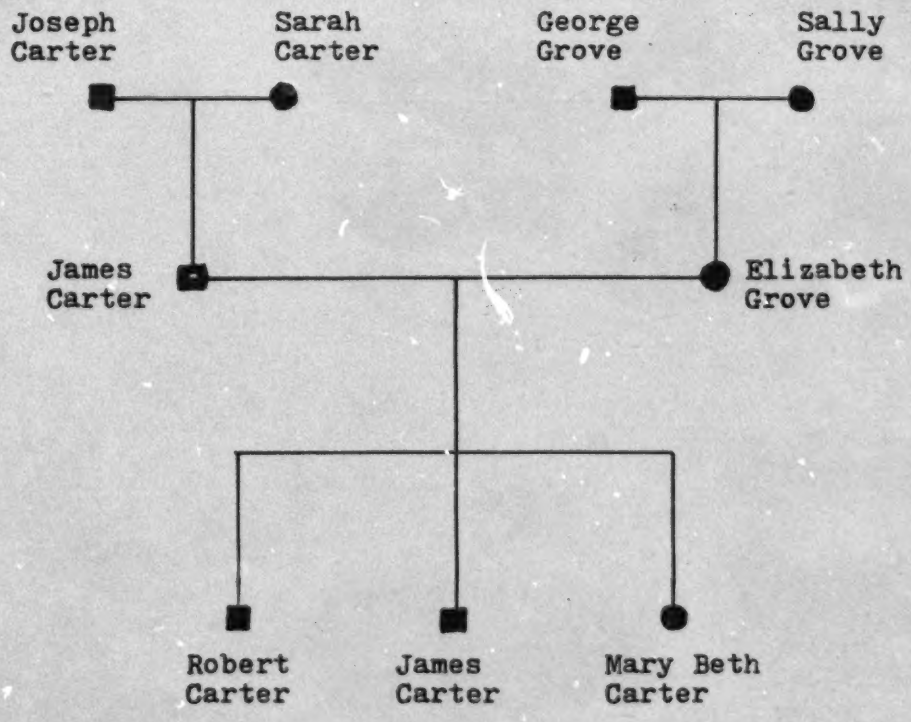
   Reindeer Moss -- fire starter, terrarium

   Thistle -- lining of bird's nest

   Cattails -- muskrat homes, rush seating in chairs

   British Soldier -- terrarium

6. 15 points for correct completion of family tree; if incomplete, award 1 point for each name correctly placed and 2 points for each complete generation.



7. 6 points for the correct answer.

   Distance = 3 miles

8. 9 points for entire answer; 6 points if first part of answer is given, 3 points if second part is given.

   First: Turn the compass housing until the red and white (magnetic) needle lies directly over the black (orienting) arrow.

   Second: Read the number of degrees that lines up with the direction of travel arrow -- that is the direction of travel to your destination.

9. 3 points for each correct answer.

   food

   warmth

   water

10. 3 points for each correct answer.

    Get water from a stream or pond or puddle and add chlorine to it (by using household bleach such as Clorox).

    Collect water from the air by laying a piece of plastic over a hole in the ground and letting water collect inside.

APPENDIX D

RAW SCORES

CLASS MEANS

TABLE X

INDIVIDUAL PRETEST SCORES OF CONTROL SUBJECTS

Subjects	Test Section[a]					Total
	I	II	III	IV	V	
Class A						
EG	4	11	15	6	3	39
SD	3	5	15	0	3	26
TB	14	7	15	6	0	42
KS	1	9	0	0	9	19
EY	3	10	0	6	12	31
SP	2	5	15	0	0	22
PS	3	3	15	6	9	36
AH	2	7	0	6	15	30
KS	2	7	0	6	9	24
MG	14	6	15	6	12	53
Class B						
DR	5	9	0	0	3	17
LS	3	13	0	0	12	28
EA	12	4	0	6	9	31
RG	15	11	15	6	6	53
DD	4	8	0	6	6	24
KC	9	0	9	0	0	18
KH	2	11	12	0	9	34
TB	13	9	15	0	6	43
MF	15	11	15	6	9	56
Class C						
KV	2	9	12	0	15	38
CB	0	0	0	6	9	15
CB	15	11	0	6	12	44
KM	6	6	0	0	12	24
CF	15	0	0	6	12	33
TC	1	3	0	6	3	13
JN	0	6	0	6	3	15
MS	15	6	0	6	6	33
LR	0	6	0	0	3	9
BS	2	0	0	0	9	11
MS	4	4	0	6	12	26
JS	7	6	0	0	9	22
LM	2	10	0	0	6	18

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

TABLE XI

INDIVIDUAL POSTTEST SCORES OF CONTROL SUBJECTS

Subjects	Test Section[a] I	II	III	IV	V	Total
Class A						
EG	5	9	15	6	12	47
SD	15	13	15	6	15	64
TB	15	10	15	6	12	58
KS	3	5	0	6	6	20
EY	3	10	0	6	15	34
SP	3	11	15	6	12	47
PS	3	10	15	15	12	55
AH	14	9	13	0	9	45
KS	2	12	0	6	9	29
MG	15	13	15	12	15	70
Class B						
DR	9	15	0	15	12	51
LS	3	11	0	9	12	35
EA	15	13	0	9	12	49
RG	15	7	15	9	15	61
DD	2	6	0	6	0	14
KC	15	15	0	6	12	48
KH	9	11	15	0	15	50
TB	14	12	15	6	0	47
MF	15	13	15	6	12	61
Class C						
KV	14	9	15	6	15	59
CB	6	10	0	6	6	28
CB	15	13	0	6	12	46
KM	7	15	0	6	9	37
CF	9	11	0	6	15	41
TC	4	13	0	15	9	41
JN	3	7	3	6	9	28
MS	15	15	13	15	9	67
LR	4	10	0	6	9	29
BS	6	7	15	0	6	34
MS	15	12	15	6	9	57
JS	2	15	0	0	6	23
LM	15	12	0	0	9	36

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

TABLE XII

INDIVIDUAL PRETEST SCORES OF EXPERIMENTAL SUBJECTS

Subjects	Test Section[a] I	II	III	IV	V	Total
Class A						
JS	3*	4	15	6	9	37
AR	9	10*	15	6	6*	46
DG	2	10	15	6	9	42
TG	3	5	0	6	0	14
[illegible]T	3	9	15	6	9	42
JW	2	10*	0	6	9	27
CK	3	3*	0	6	0	12
JN	3*	11	15	0	0	29
PG	3	11*	0	0	0	14
CC	4	11*	0	0	12	27
GB	0*	8*	0	0	9	17
LG	1	7*	0	0	6	14
MB	0	10*	0	6	6*	22
MS	1	9*	0	6	3	19
CT	5	9*	15	0	0*	29
Class B						
CH	15*	11*	0	0	9	35
LD	12	7	15	0	6	40
MO	14*	9*	12	6	9*	50
JP	2*	7*	0	6	12*	27
LP	2*	3*	0	0	6*	11
NW	10*	9*	0	6	6*	31
JK	0*	9*	0	0	6*	15
JA	3*	11	0	6	9*	29
KP	0	9	0	6	9	24
BR	15	6	0	6	9*	36
JG	3	0*	0	6	3	12
LB	3	4*	15	6	0	28
Class C						
JM	2*	7*	0	0	9	18
ED	15	3	15	6	6*	45
BS	0	6	0	0	6	12
TS	15*	7*	0	6	12	40
RF	14	7	0	6	0	27
DM	15*	9	0	6	6	36

TABLE XII (CONTINUED)

Subjects	Test Section I	II	III	IV	V	Total
Class C (Cont.)						
TL	2	0*	0	0	12	14
KH	6*	8*	0	0	9	23
JM	2	12	0	6	9	29

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

* Indicates that subjects did not participate in the activity for which the section tested.

TABLE XIII

INDIVIDUAL POSTTEST SCORES OF EXPERIMENTAL SUBJECTS

Subjects	Test Section[a] I	II	III	IV	V	Total
Class A						
JS	3*	15	15	12	12	57
AR	11	15*	13	6	6*	51
DG	14	7	15	6	12	54
TG	3	10*	0	9	9	30
ET	5	10*	15	6	15	51
JW	15	10*	15	9	15	64
CK	15	7*	15	6	12	55
JN	3*	12	15	6	15	51
PG	4	10*	0	0	12	26
CC	5	11*	0	0	12	28
GB	12*	6*	0	0	15	33
LG	5	11*	0	6	12	34
MB	11	9*	15	6	12*	53
MS	8	11*	0	6	6	31
CT	13	8*	15	6	9*	51
Class B						
CH	14*	15*	0	6	9	44
LD	13	12	15	0	12	52
MO	15*	10*	15	6	12*	58
JP	3*	9*	15	6	12*	45
LP	0*	4*	0	0	9*	13
NW	14*	13*	15	15	3*	60
JK	0*	9*	0	0	3*	12
JA	3*	12	15	9	9*	48
KP	2	5	2	6	12	27
BR	15	10	15	6	9*	55
JG	9	6*	0	6	6	27
LB	15	7*	15	0	12	49
Class C						
JM	3*	7*	15	6	12	43
ED	15	13	15	6	9*	58
BS	0	9	0	9	12	30
TS	15*	7*	0	15	15	52
RF	15	13	0	6	12	46
DM	15*	11	0	6	12	44

TABLE XIII (CONTINUED)

Subjects	Test Section I	II	III	IV	V	Total
Class C (Cont.)						
TL	0	10*	13	6	15	44
KH	0*	10*	0	3	9	22
JM	5	13	13	6	15	52

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

* Indicates that subject did not participate in the activity for which the section tested.

TABLE XIV

MEAN PRETEST SCORES OF CLASSES A, B, AND C

Group and Class	Test Section[a] I	II	III	IV	V	Total
Control Group						
Class A	4.80	7.00	9.00	4.20	7.20	32.20
Class B	8.67	8.44	7.33	2.67	6.67	33.78
Class C	5.31	5.15	0.92	3.23	8.54	23.15
Experimental Group						
Class A	2.80	8.47	6.00	3.60	5.20	26.07
Class B	6.58	7.08	3.50	4.00	7.00	28.17
Class C	7.89	6.56	1.67	3.33	7.67	27.11
Experimental Participants						
Class A	3.00	8.33	6.00	3.60	5.50	---
Class B	6.60	8.25	3.50	4.00	5.40	---
Class C	6.60	7.40	1.67	3.33	7.88	---

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

TABLE XV

MEAN POSTTEST SCORES OF CLASSES A, B, AND C

Group and Class	Test Section[a] I	II	III	IV	V	Total
Control Group						
Class A	7.80	10.20	10.30	6.90	11.70	46.90
Class B	10.78	11.44	6.67	7.33	10.00	46.22
Class C	8.85	11.46	4.69	6.00	9.46	40.46
Experimental Group						
Class A	8.40	10.13	8.87	5.60	11.60	44.60
Class B	8.58	9.33	8.92	5.00	9.00	40.83
Class C	7.56	10.33	6.22	7.00	12.33	43.44
Experimental Participants						
Class A	9.00	11.33	8.87	5.60	12.25	---
Class B	10.80	9.75	8.92	5.00	10.20	---
Class C	7.00	11.80	6.22	7.00	12.75	---

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

TABLE XVI

MEAN CHANGE FROM PRETEST TO POSTTEST
FOR CLASSES A, B, AND C

Group and Class	Test Section[a] I	II	III	IV	V	Total
Control Group						
Class A	3.00	3.20	1.30	2.70	4.50	14.70
Class B	2.10	3.00	-0.67	4.67	3.33	12.44
Class C	3.54	6.31	3.76	2.77	0.92	17.31
Experimental Group						
Class A	5.60	1.67	3.76	2.00	6.40	18.53
Class B	2.00	2.25	5.42	1.00	2.00	12.67
Class C	-0.33	3.78	4.56	3.67	4.67	16.33
Experimental Participants						
Class A	6.00	3.00	2.87	2.00	6.75	---
Class B	4.20	1.50	5.42	1.00	4.80	---
Class C	0.40	4.40	4.56	3.67	4.88	---

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival.

TABLE XVII

RANGES OF INDIVIDUAL SCORES

Group	Test Section[a] I	II	III	IV	V	Total
Pretest						
Control Group						
High	15	13	15	6	15	53
Low	0	0	0	0	0	9
Experimental Group						
High	15	12	15	6	12	50
Low	0	0	0	0	0	11
Experimental Participants						
High	15	12	15	6	12	--
Low	0	3	0	0	0	--
Posttest						
Control Group						
High	15	15	15	15	15	70
Low	2	5	0	0	0	14
Experimental Group						
High	15	15	15	15	15	64
Low	0	5	0	0	6	12
Experimental Participants						
High	15	15	15	15	15	--
Low	0	5	0	0	6	--

[a] Section I is Water Ecology, II is Forest Plants, III is Graveyard, IV is Map and Compass, V is Survival. Possible range on all sections is zero to 15; possible total range is zero to 75.